

**WATER RESOURCES INVESTIGATION**

**CONNECTICUT RIVER BASIN**

**EAST HARTFORD LOCAL PROTECTION**

**MODIFICATION STUDY**

**PLAN OF STUDY**



**DEPARTMENT OF THE ARMY**  
**NEW ENGLAND DIVISION, CORPS OF ENGINEERS**  
**WALTHAM, MASS.**

**JULY 1977**

**II**

CONNECTICUT RIVER BASIN  
EAST HARTFORD LOCAL PROTECTION  
MODIFICATION STUDY

PLAN OF STUDY

Department of the Army  
New England Division, Corps of Engineers  
Waltham, Mass.

## PLAN OF STUDY

### Water Resources Investigation Connecticut River Basin

#### East Hartford Local Protection-Modification Study Preface

This Plan of Study presents background information about the study area and the general procedures to be followed in determining the need for and advisability of modifying the existing East Hartford Local Protection Project to provide a higher degree of flood protection for the highly developed center of East Hartford, Connecticut. Other allied purposes will be considered in developing and formulating the most economical and optimum plan which meets the needs and desires of the community. Portions of this Plan of Study will by reason of continued coordination, communications, and findings, be subject to change as required.

In seeking solutions to the flood control needs of the town of East Hartford, consideration will be given to the objectives of National Economic Development and Environmental Quality as well as Regional Development and Social Well-Being of the people. All significant adverse and beneficial project effects on the environment, including the esthetics of the area, will be identified and assessed, and the feasibility of eliminating or minimizing adverse effects will be fully explored.

The East Hartford Local Protection-Modification Study is a feasibility study of survey scope referenced by the Water Resources Council as Level C. This study will incorporate and update information from previous studies of the Connecticut River Basin at East Hartford. Other water resource needs will be determined at public meetings and through coordination with various Federal and State agencies as well as local interests.

## TABLE OF CONTENTS

<u>Section</u>	<u>Description</u>	<u>Page</u>
A	<u>Authority for Study</u>	
	1. Background	1
	2. Authority	2
B	<u>Purpose of Plan of Study</u>	
	3. Purpose	3
	4. Study Objectives	3
C	<u>Stage I Study Results</u>	
	5. Resources and Economy	4
	6. Environmental Setting	8
	7. Hydrology	10
	8. Level of Flood Protection	13
	9. Problem Identification	18
	10. Formulation of Alternatives	19
	11. Impact Assessment & Evaluation	19
D	<u>Study Effort</u>	
	12. Public Involvement	20
	13. Coordination	20
	14. Estimated Study Costs	20
	15. Anticipated Schedules	21
	16. Constraints and Controls	21
	17. Submission of Reports	21
E	<u>Recommendation</u>	21

## TABLES

<u>No.</u>	<u>Title</u>
1.	Major Land Use Summary
2.	Population Statistics
3.	Historic Flood Level, Hartford, Connecticut
4.	Effect of Existing Reservoirs on Floods of Record
5.	Design Flood Comparisons
6.	East Hartford Local Protection Project-Comparative Heights of Protection
7.	Flood Losses, Connecticut River Basin

## PLATES

<u>No.</u>	<u>Title</u>
1.	Basin Map
2.	General Plan
3.	Plan and Profile No. 1
4.	Plan and Profile No. 2
5.	Plan and Profile No. 3
6.	Plan and Profile No. 4
7.	Plan and Profile No. 5
8.	Plan and Profile No. 6
9.	Plan and Profile No. 7
10.	Plan and Profile No. 8
11.	Plan and Profile No. 9
12.	Discharge Frequency Curves - Middletown, Connecticut
13.	Elevation Frequency Curves - Hartford Memorial Bridge
14.	Discharge Rating Curve - Hartford Memorial Bridge

## APPENDICES

<u>No.</u>	<u>Title</u>
1.	Study Announcement and Mailing List
2.	Letters of Comment

PLAN OF STUDY  
WATER RESOURCES INVESTIGATION  
CONNECTICUT RIVER BASIN  
EAST HARTFORD, CONNECTICUT

A. Authority for Study

1. Background

Since its founding in the seventeenth century the Town of East Hartford has been subject to periodic flooding from the Connecticut and Hockanum Rivers. The greatest floods for which reliable records exist occurred in March 1936, September 1938, and August 1955.

Realizing the severity of the flooding problem the 69th Congress (First Session) passed House Document No. 308 on 21 January 1927, which directed the Corps of Engineers to conduct a flood control study of the Connecticut River. A report, which took the name "308 Report", dated 11 February 1936, was submitted to Congress with the recommendation that 10 flood control reservoirs be built on the tributaries of the Connecticut River in Vermont and New Hampshire. This report was the basis for the 1936 Flood Control Act which established a Federal interest in flood control.

Ironically, one month after the "308 Report" was submitted to Congress, the Connecticut River Basin experienced the disastrous flood of March 1936. As a result of this flood another study was made and reported in March 1937 (reference 1). This report provided for the first general comprehensive plan for flood control for the basin and included 20 reservoirs, with 10 alternative reservoirs, and most important, seven local protection projects at Hartford, East Hartford, Springfield, West Springfield, Chicopee, Holyoke, and Northampton. This comprehensive plan was approved in the 1938 Flood Control Act (reference 2).

There have been numerous modifications to the basic flood control plan over the years, but presently the Corps of Engineers has constructed a total of 16 dams and all seven of the original local protection projects in the basin.

Existing flood control structures in the basin are discussed in more detail in the 1970 report: "Connecticut River Basin Comprehensive Water and Related Land Resources Investigation", Volume VIII, (reference 3).

## 2. Authority

A resolution of the Committee on Public Works of the United States Senate adopted 11 May 1962, recommended a review of existing reports in the Connecticut River Basin. The resolution was as follows:

"That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act, approved June 12, 1902, be, and is hereby, requested to review the reports on the Connecticut River, Mass., New Hampshire, Vermont and Connecticut, published as House Document Numbered 455, Seventy-Fifth Congress, second session, and other reports, with a view to determining the advisability of modifying the existing project at the present time, with particular reference to developing a comprehensive plan of improvement for the basin in the interest of flood control, navigation, hydro-electric power development, water supply, and other purposes, coordinated with related land resources."

A seven year Federal-State study effort resulted in a report entitled "Comprehensive Water and Related Land Resources Investigation", dated June, 1970. The coordinating committee which guided this study recommended a 1980 basin plan which included the construction of additional flood control reservoirs to supplement the existing 16 reservoirs and seven mainstem local protection projects (including East Hartford). Since 1970, the Basin States have withdrawn support of the plan, consequently, the New England River Basins commission (NERBC) chaired a supplemental flood control study of the Connecticut River Basin. The resulting report, "The River's Reach", presently in draft form, includes recommendations to study reducing the possibility of overtopping by raising the existing dikes and floodwalls in East Hartford, Springfield, West Springfield, Chicopee, Holyoke, and Northampton in lieu of the seven additional flood control dams recommended in the 1970 CRB report. Other recommendations include construction of small dams and dikes where economic, environmental and social impacts and local cost sharing, are acceptable and the utilization of effective non-structural solutions to flood plain management problems wherever possible. The final report is scheduled for publication in summer 1977.

Concurrent with the East Hartford Modification study is a flood plain management study of East Hartford, Glastonbury, Rocky Hill and Wethersfield, Connecticut authorized under Section 73 of the 1974 Flood Control Act.

This study will determine the feasibility of implementing non-structural flood control measures within the Intermediate Regional Flood Plain, excluding areas now protected by dikes or walls. Close coordination will be maintained to insure that the problems and needs of East Hartford are addressed and recommendations of the two studies are compatible.

## B. Purpose of Plan of Study

### 3. Purpose

The purpose of the Plan of Study is to establish the procedure for conducting a study to determine the feasibility of modifying the existing flood control system in East Hartford. This document will be used as a management tool to assist in direction, and coordination of the investigation. The Plan of Study will:

- a. Provide the planner with an advance planning tool for developing a plan of action.
- b. Define at the earliest practicable date the anticipated problems associated with the analysis, formulation, policies, objectives, needs and scale of studies required during the course of the investigation.
- c. Insure early and continuing coordination with, and services from, other Federal, State, regional and local agencies, and generate response from responsible and informed local groups. Early coordination is essential to avoid delay of investigations and to accomplish a plan of improvement that is both responsible to the needs of, and acceptable to the State and communities involved.
- d. Provide the Chief of Engineers with advance information on the nature of the investigation.

### 4. Study Objectives

In seeking solutions to the flood control needs of the study area, consideration will be given to the national objectives for water and related land resources as stated in the Water Resource Council's "Principles and Standards". They are as follows:

National Economic Development - Maintaining or increasing the value of the nations output of goods and services as well as improving natural economic efficiency may be achieved through the development of water and related land resources. In accordance with this objective, the present and projected



needs will be assessed for flood control, recreation, water quality, fish and wildlife, navigation, water supply, and other elements of water resource development. The annual costs of the measures of these various purposes will be compared against the annual benefits in the interest of selecting projects based on national economic objectives.

Environmental Quality - The preservation and enhancement of the Nation's environmental resources is essential to insure their availability for future use. The investigation will consider the preservation of natural and cultural areas, creation or restoration of scenic areas, preservation and enhancement of recreational areas, and the rehabilitation and protection of aesthetic values in the study area. In accordance with the National Environmental Policy Act of 1969, all available means will be utilized to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic and other requirements of present and future generations.

Regional Development - The region's income gains and economic impact will be evaluated on the basis of possible expansion of business, industry, and recreation and on population and social development that could result from a comprehensive plan of improvement.

Social Well-Being - The social well-being of the greatest number of people shall be the overriding determinant in considering the best use of water and related land resources. Consideration will be given to project effects on real income, security of life, health and safety, education, cultural and recreational opportunities, emergency preparedness, and other factors. Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of a few to the disadvantage of many.

### C. Stage I Study Results

#### 5. Resources and Economy

a. General - East Hartford, prior to 1900, was agriculturally oriented, although certain industries (glassworks, powder mills) did flourish. With the emergence of Hartford as a major commercial center by 1900 the town became primarily a residential suburb. Since 1929, when Pratt and Whitney

Aircraft Company located here, the town has become a major industrial center whose principal industries now include - the manufacture of aircraft engines, precision parts and steel fabrication. As Table 1 indicates, this growth in the manufacturing sector, as defined by land use statistics, has continued through the last decade. Another area, however, has been growing even more rapidly - the trade and services area. The figures tend to understate the actual growth in this area of East Hartford's economy since two shopping malls, totaling approximately 5.1 acres, have been built since 1973. The town is rapidly becoming the primary retail center for several of the surrounding communities.

TABLE 1

Major Land Use Summary  
Acres and % of Total

	<u>1960</u>	<u>%</u>	<u>1970</u>	<u>%</u>	<u>Percent Change</u>
Residential by					
Density -- High	1077	-9.3	423	3.63	-60.7%
Low	2520	21.6	4048	34.8	80.5%
Total	3597		4471		24.3%
Manufacturing	437	3.8	727	6.2	66.4%
Trades + Services	436	3.8	862	7.4	97.7%
Active Agriculture	2291	20.1	952	8.2	-58.4%
Institutional	216	1.96	Not Available		

b. Population - East Hartford's population during the period from 1930-1970 has shown a higher rate of growth than that of both Hartford County and the State. The rate of growth, detailed in Table 2, has decreased from a 62.2% rise for the period 1950-60 to a 30.7% rise for the period 1960-70 and is projected to increase only 6.8% from 1970-2000.

c. Employment - East Hartford was a net importer of labor in 1970, providing employment in nonagricultural and manufacturing areas for 40,930 people while possessing a labor force of 27,289. The employment was distributed as follows: 33.8% in manufacturing, 55.7% in white collar jobs, and 13.0% in government. In comparison the Hartford SMSA reported figures of 29.0%, 57.8%, and 13.7%, respectively.

During the 1970's, unemployment for the town jumped from 2% in 1970 to 9.2% in June of 1976. This latter figure is higher than the generally experienced by other towns in the Hartford labor area.

Projections indicate that the level of total employment in the town will increase by approximately 27.1% between 1970 and 1990, and then will level off in the 1990's. Meanwhile, over the period 1970 - 2000, employment in the capitol region is expected to rise about 52.1%. East Hartford's share of the area's employment will probably drop from 15.3% in 1970 to 12.3% by 2000. (These projections must be viewed with caution since they are based upon the population data discussed earlier).

d. Income - The median income in East Hartford in 1970 was \$11,771 as compared to the Hartford SMSA median of \$12,282 and a state median of \$11,811. Only 4.4% of East Hartford's population had an income below the poverty level, a figure that was 6.9% for the Hartford SMSA and 7.2% for the state as a whole, in 1970.

e. Transportation - East Hartford is well served by all modes of transportation. Bisected by Interstate 84/86, the main road between New York City and Boston, across the river from Interstate 91, a north-south road following the Connecticut River, and also serviced by several other major highways, the town is easily accessible by commuters and truck service. Freight service is provided by Conrail while interstate bus and passenger rail transportation is available in Hartford. Bradley International Airport, roughly twenty miles to the northwest, provides convenient air service. Local bus service is provided to Hartford and the surrounding communities by the Connecticut Company Bus Lines.

TABLE 2  
POPULATION STATISTICS\*

<u>Year</u>	<u>East Hartford</u>	<u>% Change Over Last Period</u>	<u>Hartford County</u>	<u>% Change</u>	<u>Connecticut</u>	<u>% Change</u>
1930	17,125		421,097		1,606,903	
1940	18,615	8.7%	450,189	6.9%	1,709,242	6.4%
1950	29,933	60.8%	539,661	19.7%	2,007,280	17.4%
1960	43,977	62.2%	689,555	29.6%	2,535,234	26.3%
1970	57,583	30.9%	816,737	18.4%	3,032,217	19.6%
2000	61,496	6.8%				

\*Source: Past Statistics - U. S. Bureau of the Census  
Projection - Conn. DEP/CRCOB 1976

f. Housing - As in other areas of the economy East Hartford's growth in housing has been greater than the growth rate experienced by both the state and Hartford County. These growth rates were 45.1% and 19.9% respectively for the 1960-1970 period, and 1.6%, 7.8% and 8.7% respectively for the 1970-1974 period. According to 1974 figures the total number of units in East Hartford is 19,254, consisting of 10,149 single family homes, 1,113 two family homes, 6,379 multi-family units, and 500 mobile homes, since that time a large increase in requests for construction permits has been reported.

g. Summary - East Hartford is a town that has been undergoing rapid development in nearly all phases of its economy. This development parallels the shifting emphasis away from the central cities to the suburbs which occurred nationwide during the 1950's and throughout the 1960's. The areas left undeveloped in East Hartford are presently rather limited: roughly 75% of the land has been developed and of the remaining 25%, 15% is inland wetlands. East Hartford is thus likely to experience a more limited rate of growth in the short-term, with a leveling off some time in the near future.

The current population figures for East Hartford are subject to dispute. In 1974 the Connecticut Department of Health did a survey which reported a population of 53,500, a 6.6% loss for the town between 1970-1974. The town rejected these figures on the basis that the Health Department's survey places a heavy reliance upon the number of school age children, a figure which is dropping in the town due to a changing composition of the population. Thus the population statistics reported by the Department of Health would tend to understate the actual population. The population projections are based upon the population reported by the town.

## 6. Environmental Setting

The Connecticut River rises in the Connecticut Lakes of Northern New Hampshire adjacent to the Canadian border. The river follows a general southerly course along the approximate centerline of its watershed for about 404 miles to its mouth on Long Island Sound at Old Saybrook, Connecticut. The lower 60 miles of the river is tidal, with a mean tidal range during low river stages of 3.4 feet at the mouth, and about 1.2 feet at Hartford. The fall in the river is about 2,200 feet with steepest portion averaging 30 feet per mile occurring in the first 30 miles below the outlet of Third Connecticut Lake. From Wilder Dam, Vermont to the head of tidewater, eight miles above Hartford, Connecticut, the fall averages about 2 feet per mile. The Connecticut River basin, shown on Plate 1, has a total drainage area of 11,250 square miles.

The East Hartford local protection project is located 52 miles above the mouth of the Connecticut River at its confluence with the Hockanum River. The project, completed in 1943, provides protection for about 760 acres of residential, commercial, industrial and public property in the highly developed center of East Hartford. The protective works consist of approximately 20,000 feet of earth dike and 750 feet of concrete floodwall along the Connecticut and Hockanum Rivers, extending from the high ground near Greene Terrace in the north, to high ground at Brewer Lane and Central Avenue in the south. The project also consists of two stop-log structures, three pumping stations for interior drainage, and appurtenant drainage structures and facilities.

The alignment of the dike (See Appendix 1) travels through diverse surroundings including residential, commercial, industrial, and undeveloped areas. To adequately describe the environmental setting of the project, it is necessary to divide the project into sections.

#### North Section from Greene Terrace to Railroad Embankment

This section originates in a residential area and travels westerly for about 3,500 feet toward the riverbank of the Connecticut River. It is nearly totally undeveloped, comprised mostly of woodland and marshland. The dike then follows the riverbank southerly 3,000 feet to the railroad embankment. This particular segment of the dike was erected after most vegetation had been cleared to the river. Today, one cannot view the river due to the new vegetation that has developed between the dike and river. Water-loving plants such as Red and Silver Maple, willows, and alder are abundant in this area.

#### Railroad Embankment to Connecticut Boulevard

This section runs approximately 3,100 feet parallel to the river to high ground at Connecticut Boulevard. Thick, new growth vegetation between the dike and river is also prominent along this section. Industrial facilities and some residential homes are situated along the landside of the dike.

#### Connecticut Boulevard to Founders Bridge

This segment of dike also parallels the river and passes through undeveloped land for about 1,200 feet in an area where vegetation along the river is thick and vigorous.

## Founders Bridge to Connecticut Route 2

This portion of the project begins with a section of buttressed concrete wall, originally built to protect several oil storage tanks which have since been removed leaving a vacant plot of land. Here the wall joins an earth dike which travels south paralleling the river for about 2,200 feet. The dike then turns perpendicular to the river and travels through undeveloped land for 1,600 feet, tying into the highway embankment of Connecticut Route 2. This section of the project protects numerous commercial and industrial facilities at Founders Plaza. The Plaza development is comprised of contemporary architecture and well-maintained surroundings. Riverside of the dike the attention of the public has been drawn to an area which overlooks the river and Hartford beyond. It has a semi-park-like quality with large shade trees and grassy areas.

## Connecticut Route 2 to Main Street

This section runs along the Hockanum River, around the Metropolitan District Water Pollution Control Plant, and then traverses back around to Main Street for a distance of about 3,000 feet. The riverside is totally undeveloped, comprised of wetlands and dense woodlands. Landside, a pumping station and ponding area lie adjacent to the treatment facilities. A few commercial establishments along Pitkin and Main Streets tightly abutt the dike which requires a stop-log structure at Main Street.

## Main Street to Brewer Lane

This southern portion of the project parallels Main Street, crosses under I-84, proceeds behind the City Hall paralleling Saunders Street and terminates along Brewer Lane at high ground. This section of dike, approximately 3,000 feet in length is not as visually restrictive in this reach as in others, simply because it is not very high. The land on the riverside, extending down to the Hockanum River is heavily wooded, and forms a natural backdrop for residential areas along Saunders Street and Brewer Lane.

## 7. Hydrology

a. General - The basic hydrology presented in this report was taken largely from prior hydrologic engineering studies pertinent to the study area. All pertinent data will be reviewed and updated as the progress of project reformulation studies warrant.

b. Climatology - Central Connecticut has a variable climate characterized by frequent but usually short periods of precipitation. This section lies in the path of the "prevailing westerlies" and is exposed to the cyclonic disturbances that cross the country from the west and southwest toward the northeast

quadrant of the country. The area is also exposed to coastal storms, some of tropical origin, that travel up the Atlantic seaboard. Thunderstorms either of a local origin or associated with a frontal system, occur generally during the summer months.

c. Temperature - Average monthly temperatures in East Hartford vary considerably throughout the year with a mean annual temperature of about 50° Fahrenheit. The summer temperatures average in the upper 60 and low 70 degrees, with winter temperatures averaging in the upper 20 and low 30 degrees. Freezing temperatures can be expected from the middle of November until the end of March.

d. Precipitation - The average annual precipitation of East Hartford is about 42 inches, distributed rather uniformly throughout the year. Maximum and minimum annual precipitation at the National Weather Service recording station over 67 years of record are 62.9 and 29.4 inches, respectively.

e. Snowfall and Snow Cover - Based on 66 years of record, snowfall at East Hartford averaged about 44 inches. Water content of the snow cover in the region reaches a maximum depth about the first of March. Maximum snow pack each year varies from zero to 5.4 inches of water equivalent with a mean of 2.4 inches.

f. Streamflow - The average annual streamflow in the Connecticut River basin is 23 inches of runoff or about 53 percent of annual precipitation, representing an average river flow at East Hartford of about 18,000 cfs. East Hartford is located in the upper end of an extensive natural storage basin and is also affected by tidal fluctuations during normal flow periods. Records of peak flood stages on the Connecticut River at Hartford which is located directly across the river from East Hartford, have been maintained by the National Weather Service.

g. Flood History - Damaging floods have been experienced on the Connecticut River and its tributaries since the establishment of the first settlements in the basin. Reliable records have been kept of flood stages at Hartford since about 1838.

The greatest flood of record on the lower Connecticut River was experienced in March 1936 when a stage of 37.6 feet (37.0 feet msl) was reached at the Hartford gauge. The second greatest flood occurred



in September 1938, with a level of 2.2 feet below the 1936 peak stage.

East Hartford is located within the limits of a long storage reach on the Connecticut River; therefore, peak flood stages at East Hartford are more a function of peak storage in the reach rather than peak flow in the river through Hartford. This storage effect creates a hysteresis effect on the rating curve at East Hartford and due to the lack of a constant stage-discharge relationship at East Hartford, the stages at East Hartford are related to peak flows on the river downstream at Middletown, Connecticut where flows are a function of maximum storage in the reach.

Historic flood levels at East Hartford versus peak flows at Middletown, Connecticut are listed in Table 3.

TABLE 3

Historic Flood Levels  
Hartford, Connecticut

<u>Date</u>	<u>Flood Level at Memorial Bridge</u>	<u>Estimated Discharge at Middletown, Connecticut</u> (cfs)
Mar 1936	37.0	267,500
Sep 1938	34.8	239,000
Aug 1955	30.0	188,000
May 1954	29.2	180,000
Nov 1927	28.4	172,000

## 8. Level of Flood Protection

a. Flood frequencies. Discharge frequency curves for the Connecticut River at Middletown, Connecticut are shown on plate 12. These curves represent natural and modified peak flow frequencies. The natural frequencies are graphical presentations of the data tabulated in table C-10, Appendix C, of the June 1970 Connecticut River Comprehensive Report (reference 3). Peak discharge frequencies were determined by a regional analysis using a Log Pearson Type III analysis as described in Water Resources Council Bulletin No. 15, entitled: "A Uniform Technique for Determining Floodflow Frequencies" (reference 4).

b. Effect of Reservoirs. Since the great floods of March 1936 and September 1938, the Corps of Engineers has constructed a system of 16 flood control reservoirs in the Connecticut River basin, which control flood runoff from 1,570 square miles, or 15 percent of the Connecticut River watershed above East Hartford. Typical flood reductions provided by the existing system of reservoirs at East Hartford and Middletown are illustrated by the natural and modified stage and discharge frequency curves shown on plates 12 and 13. It is cautioned that for every occurrence of a certain frequency flood the reduction will not be exactly as indicated by the modified frequency curves. The magnitude of reduction will vary depending on the storm orientation with respect to the upstream reservoirs. The modified frequency curves shown represent the expected average or typical reduction as determined by analyses using the "Typical Tributary Contribution Flood", as developed by the New England Division, Corps of Engineers (reference 5).

Reductions in discharges and stages that would be provided by the system in the recurrence of the specific 1936 and 1938 historical floods at Hartford are listed in table 4.

c. Original Design Flood. The East Hartford protective works were designed for a Connecticut River flow at Hartford of 248,000 cfs, which is equivalent to a flow of about 242,000 cfs at Middletown and a design flood stage of 35.0 feet msl at Memorial Bridge in East Hartford (volume 2 of Appendix, reference 1). The original 1937 design flood stage was developed by modifying a natural design

flow of 318,000 to 209,000 cfs by the then proposed 20 reservoir system and then increasing the modified flow to 248,000 cfs to allow for the estimated effects of the dikes on floodflows. The 1937 design flood was produced by approximately 7.2 inches of runoff from the basin and was estimated, at that time, to be about a 1,000-year frequency event.

TABLE 4

EFFECT OF EXISTING RESERVOIRS ON FLOODS OF RECORD

<u>Event</u>	<u>Observed</u>		<u>Modified by 16 Existing Reservoirs*</u>	
	<u>Discharge**</u> (cfs)	<u>Elevation</u> (ft msl)	<u>Discharge</u> (cfs)	<u>Elevation</u> (ft msl)
Mar 1936	267,500	37.0	206,100	32.4
Sep 1938	239,000	34.8	194,500	31.3

\* Existing reservoirs include Union Village, North Hartland, North Springfield, Ball Mountain, Townshend, Surry Mountain, Otter Brook, Birch Hill, Tully, Barre Falls, Conant Brook, Knightville, Littleville, Sucker Brook, Mad River, Colebrook.

\*\* Discharges at USGS gage at Middletown, Connecticut.  
Elevations at Memorial Bridge, East Hartford, Connecticut.

Following the record rainstorm experienced in September 1938 in New England, a new design flood was developed for the Connecticut basin and reported in 1944 (reference 6). The revised design flood was developed by orientating the 1938 storm over the basin to produce maximum uncontrolled runoff, assuming high antecedent moisture conditions. This resulted in a new design natural and modified flow at Hartford of 420,000 and 279,000 cfs, respectively. This modified flow would be equivalent to a flow of about 267,000 cfs at Middletown and a stage of about 37 feet msl at Memorial Bridge in East Hartford. The revised design flood was reported in 1944; however, the East Hartford project was partially completed and was not modified.

Due to the indefinite schedule of reservoir construction at the time the East Hartford project was constructed, the earth dikes were built to provide 5 feet of freeboard above the original design flood level. Concrete walls were built with 3 feet of freeboard.

d. Standard Project Flood. A standard project flood (SPF) was developed for the lower Connecticut River basin in 1970 in conjunction with the Connecticut River Basin Comprehensive Study (reference 3). Its primary purpose was to test the lower basin flood potential with the existing system of reservoirs in operation. The standard project storm was therefore oriented to produce maximum runoff from the uncontrolled drainage area in the lower central portion of the Connecticut River basin. The storm was assumed to occur with relatively high antecedent moisture conditions, producing a base flow in the river of about 8 cfs per square mile.

The resulting standard project flood had a natural and modified peak flow at Middletown of 383,000 and 321,000 cfs, respectively. The accompanying modified flood stage at East Hartford Memorial Bridge would be 41.2 feet msl.

Design flood comparisons relative to flood levels at East Hartford are presented in table 5.

TABLE 5  
DESIGN FLOOD COMPARISONS

<u>Flood</u>	<u>East Hartford Flood Elevation (Memorial Bridge)</u>	<u>Middletown Discharge (cfs)</u>	<u>Hartford Discharge (cfs)</u>
1937 Design Flood*	35 ft msl	242,000	248,000
1944 Revised Design Flood*	37 ft msl	267,000	279,000
1970 Standard Project Flood**	41.2 ft msl	321,000 ✓	---

\* Modified by the then proposed 20 reservoir system

\*\* Modified by existing 16 reservoir system

e. Height of Protection. As previously discussed, the existing project was designed, with freeboard, to protect against a flood having a level of 35.0 feet above mean sea level at the East Hartford Memorial Bridge. Plans and profiles of the protective works indicating height of protective works are shown on plates 3 through 11. Heights of protection, at selected stations, are also listed in table 6.

f. Stage Discharge Rating. A curve relating the discharge of the Connecticut River at Middletown with flood levels at the Memorial Bridge in East Hartford is shown on plate 14. This curve was developed from historical stage-discharge relations. The level of the SPF relative to the existing design level is also indicated on plate 14.

g. Freeboard

(1) General. Freeboard is the vertical distance measured from the design water surface to the top of a dike or wall. Freeboard is provided to allow for uncertainties in hydraulic computations, and to ensure that the desired degree of protection will not be reduced by unaccounted factors.

(2) Original Design. A uniform freeboard of 3 feet for both concrete walls and earth embankment was originally proposed for the East Hartford Local Protection Project. However, since the entire reservoir plan might not be effective for some time, the Board of Rivers and Harbors recommended the earth section be raised 2 feet; therefore, the originally adopted design freeboard was 5 feet for earth dikes and 3 feet for the concrete walls.

(3) Present Practice. Present freeboard practice allows for 3 feet of freeboard for earth dikes and 2 feet for concrete walls. Less freeboard is provided for concrete walls due to their greater resistance to failure if overtopping were to occur.

TABLE 6

EAST HARTFORD LOCAL PROTECTION PROJECT  
COMPARATIVE HEIGHTS OF PROTECTION

<u>Location</u>	<u>Station</u>	<u>Existing Height of Protection (ft msl)</u>	<u>SPF Level (ft msl)</u>	<u>SPF Level Plus Freeboard (ft msl)</u>
North end of dike	31+55	43.0	44.2	47.2
Bend in dike at Conn. River	47+73	43.0	44.2	47.2
Just upstream of RR bridge	96+85	42.5	43.7	46.7
Just downstream of RR bridge	99+40	40.7	41.9	44.9
High ground north of Conn. Blvd.	129+50	40.5	41.7	44.7
High ground south of Conn. Blvd. (Memorial Bridge)	130+70	39.9	41.1	44.1
Beginning of concrete wall	144+60	37.9	41.1	43.1
End of concrete wall	150+12	37.9	41.1	43.1
Bend in dike at Conn. River	170+00	39.1	40.3	43.3
South end of dike	240+88	39.1	40.3	43.3

## 9. Problem Identification

The Connecticut River Basin has experienced numerous floods in the past, several of which have taken the lives of basin residents and brought huge financial burdens to bear upon them. A summary of experienced losses from four of the most disasterous floods are shown in Table 7.

TABLE 7

### FLOOD LOSSES OF FOUR HISTORIC EVENTS CONNECTICUT RIVER BASIN

<u>Date</u> <u>Date of Event</u>	<u>Number of</u> <u>Lives Lost</u>	<u>Reported</u> <u>Monetary Damage</u>
November	21	\$29, 000, 000
March 1936	11	66, 400, 000
September 1938	8	48, 600, 000
August 1955	34	119, 000, 000

There are at present twenty-six specified and one unspecified (alternate to Sugar Hill on the Ammonoosuc River) authorized reservoir projects in the Connecticut Basin, and of this number 16 have been constructed. Five of the constructed projects, authorized after the lower basin tributary flood of 1955, were designed to meet tributary flood control needs and have limited effect on the Connecticut River main stem.

Of the ten remaining unconstructed flood control reservoirs deauthorization recommendations have been made for nine and before the close of calendar year 1977 they will be off the rolls. At that time only the Beaver Brook reservoir project in New Hampshire will remain as authorized.

There is a significant need to control a greater portion of the drainage area above East Hartford, or to employ alternative means of providing the desired degree of protection which was originally planned. Construction of previously authorized reservoirs has been abandoned as an alternative because Upper-basin states have withdrawn their support. It is therefore considered prudent to provide additional protection by modifying the existing system of dikes in the principal damage areas, including East Hartford.

## 10. Formulation of Alternatives

Previous water resource studies of East Hartford and the Connecticut River Basin gave consideration to a multitude of structural and non-structural alternatives designed to meet the flood control needs of the basin. Initially, additional upstream storage appeared to be the best method of achieving the desired level of protection at the principle damage areas, however, the upstream states have withdrawn their support for such a plan. For this reason other alternatives were evaluated and it now appears that the most acceptable structural solution would be to raise the height of the existing local protection projects. It is the purpose of this study to formulate various dike raising schemes with an eye toward optimizing the level of protection. Protection will not be limited to those areas presently behind the dike but may include other flood prone areas if incrementally justified. In addition to evaluating the above structural options, non-structural alternatives will be considered and recommended if found to be more prudent than dike raising. Finally, since it is our objective to arrive at a solution which meets the needs of the town, recreation or any other water related purpose other than flood control may be included if there is local interest for a multi-purpose project.

## 11. Impact Assessment & Evaluation

The assessment will cover all environmental, social, and economic effects following the guidelines established by ER 1105-2-105, to insure that all significant adverse and beneficial project effects is taken fully into account.

Project encouragement of development trends will be carefully assessed to assure preservation of environmental resources. On the other hand, controlled development and wise usage of areas rendered free of flood threat may produce social benefits justifying work improvements. The resulting decisions and project recommendations will be made in the best overall interests of the public with a balance maintained between elements of dollar benefits and costs, the degree of satisfaction of public needs, and the extent of other types of effects. To accomplish this, the tentative profile of existing conditions obtained from this and prior studies will be augmented to show projections of conditions with and without the project or alternatives over the life of the projects. Significant effects will be identified and evaluated. Any desirable project modification revealed by the assessment will be considered. Evaluation is the process through which values are assigned to the impacts and is being accomplished by interpreting whether the consequences of the alternatives are beneficial



or adverse in relation to the objectives and desires of residents of the study area. It is the purpose of this activity to give residents an opportunity to express their views regarding alternatives and their effects.

#### D. Study Effort

##### 12. Public Involvement

Initiation of the study was made in December 1976 with the distribution of an announcement (See Appendix 1) which explained the nature of the study and encouraged public officials and the general public to express their views and to make known any problems or needs of which we are not aware. Letters of comment received in response to that announcement as well as letters supporting the study from the Governor of Connecticut and Mayor of East Hartford can be found in (Appendix 2). Further coordination will be maintained with other Federal, State and local agencies. Regional planning and conservation associations will be involved in the planning process through utilization of workshop-type meetings. Regular progress meetings will be held to receive local input into the study, and to inform agencies of progress during the course of the study. The public participation program will be kept flexible and responsive to the needs of all concerned local officials, private agencies and individual interests. A formal public meeting will be conducted during the formulation stage of the study and a late stage public meeting, if required, will be held at the conclusion of the study.

##### 13. Coordination

Coordination measures are continuing through conference and correspondence. Each stage of the study will be presented for comment or concurrence by other Federal, State, regional, local and civic agencies having an interest in planning or development of water resources in the study area.

##### 14. Estimated Costs

The preparation of budgetary data for the East Hartford Local Protection Modification Study is predicated upon the estimate amount of money needed to complete the work items necessary for a Level C Study. The total estimated funds required to complete the study are \$165,000. The distribution of funds will provide for an assessment of the need for additional flood protection and development of intermediate alternative solutions in FY 1977 and the development and evaluation of final alternatives in FY 1978.

#### 15. Anticipated Schedules

Completion of the study is scheduled for September 1978. The next stage of planning involves a thorough analysis of the problems identified and will conclude with a public presentation of a preliminary range of solutions, including initial plans and cost estimates. Those alternatives will be evaluated and refined and the remaining alternatives will be studied in detail during the third planning stage. This stage involves the formulation of detailed alternative plans and concludes with the preparation of the final report.

#### 16. Constraints and Controls

To date, funding to complete this Plan of Study and to initiate preliminary planning has been made available. Studies will be continued only so long as a possibility remains that a workable, economically feasible, and environmentally and socially acceptable plan of improvement can be recommended.

#### 17. Submission of Reports

Plan of Study - This report constitutes the Plan of Study.

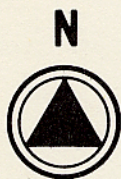
Final Feasibility Report - The submission of the feasibility report is currently scheduled for September 1978. This is dependent upon future Congressional appropriations.

Recommendation - Approval of this Plan of Study on investigations for additional flood protection in East Hartford, Connecticut is recommended.

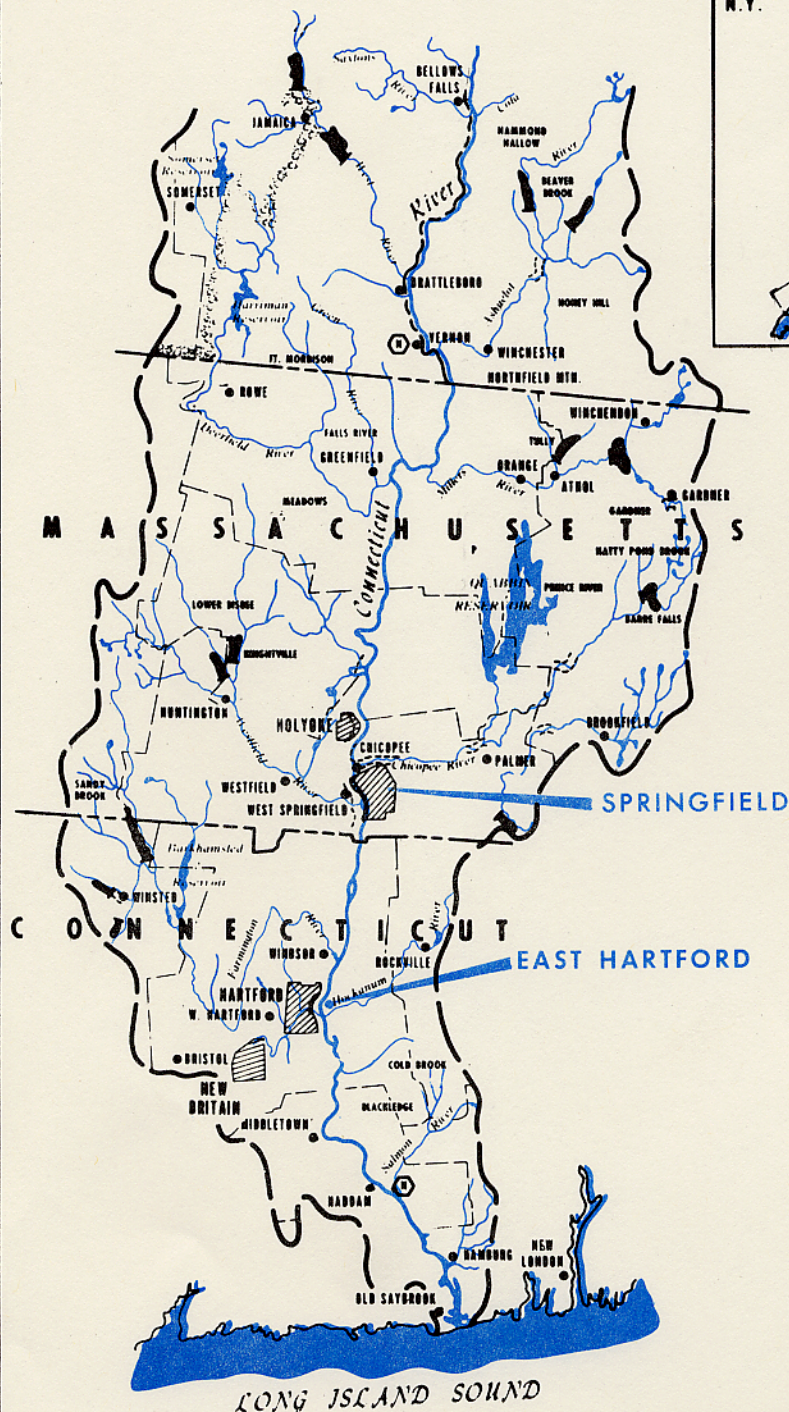
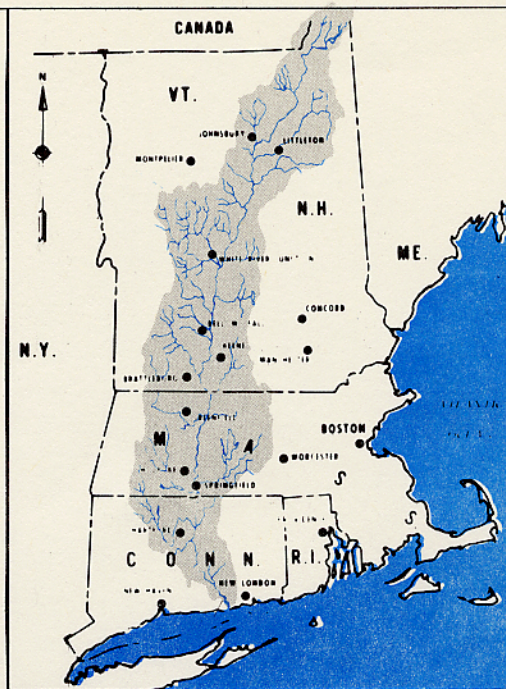
## BIBLIOGRAPHY AND REFERENCES

1. New England Division, U.S. Army Corps of Engineers, "The Report of Survey and Comprehensive Plan for the Connecticut River", dated 20 March 1937.
2. Flood Control Act approved 28 June 1938, House Document No. 455, 75th Congress, 2nd session.
3. New England Division, U.S. Army Corps of Engineers, "Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation", June 1970.
4. Water Resources Council, Hydrology Committee, "A Uniform Technique for Determining Flood Flow Frequencies", Bulletin 15, Washington, D.C., 1967.
5. New England - New York Inter-Agency Committee, "The Resources of the New England - New York Region", Reference Data, dated March 1955.
6. New England Division, U.S. Army Corps of Engineers, "Review of Reports on Surveys of the Connecticut River and Tributaries for Flood Control", dated 28 February 1940, Revised 18 December 1944.

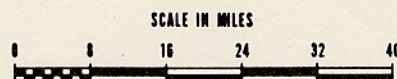




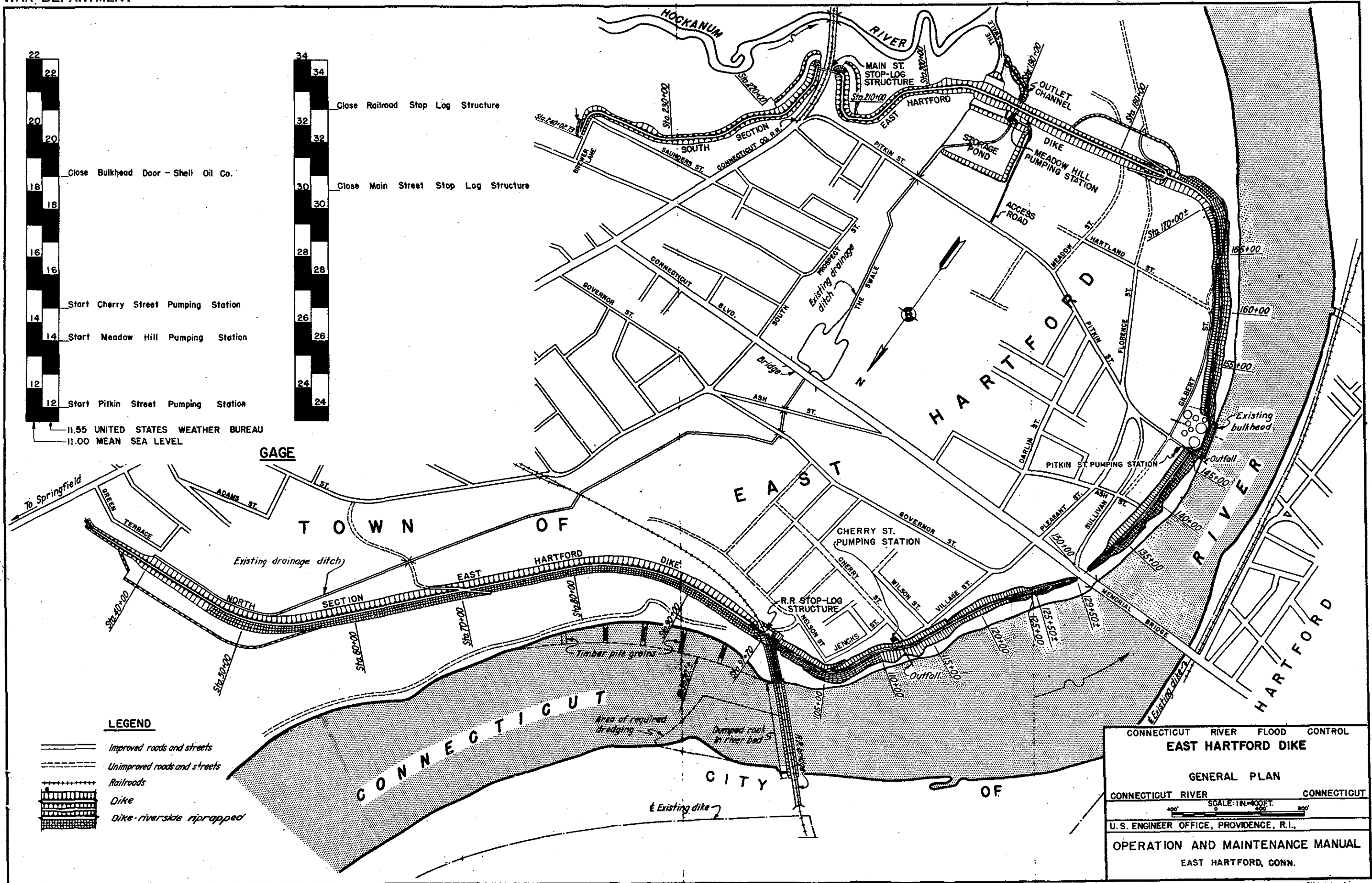
NEW  
HAMPSHIRE

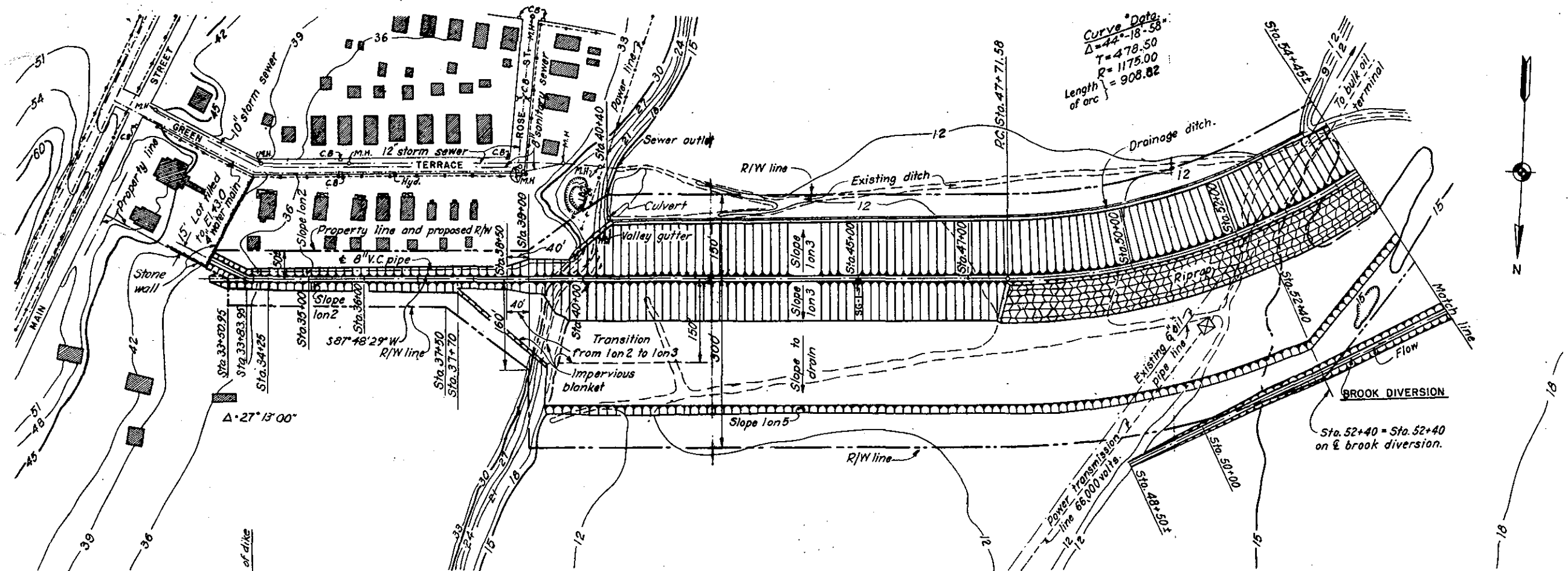


CONNECTICUT RIVER BASIN  
CORPS OF ENGINEERS  
STUDY AREAS

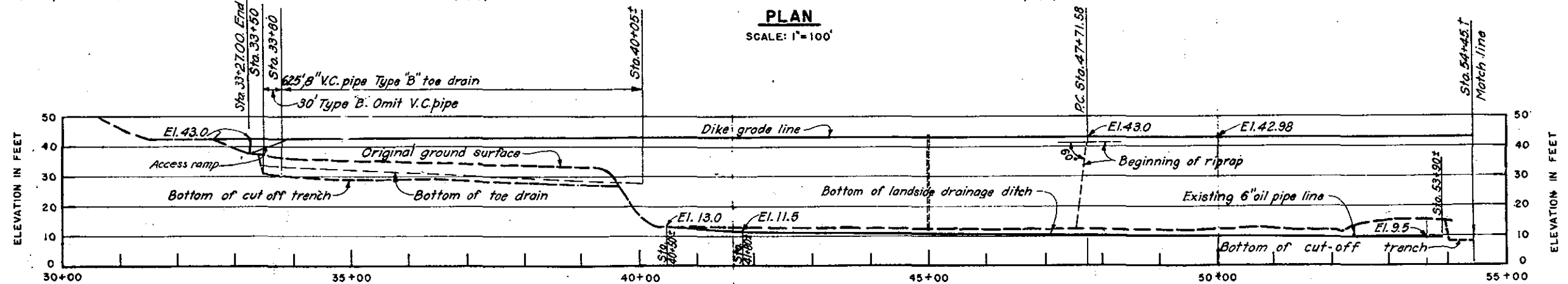






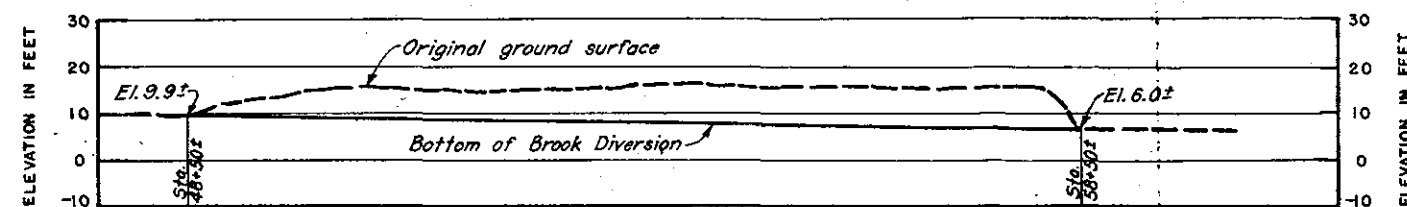


**PLAN**  
SCALE: 1"=100'



**PROFILE ON & OF DIKE**

SCALE: HOR. 1"=100'  
VERT. 1"=20'



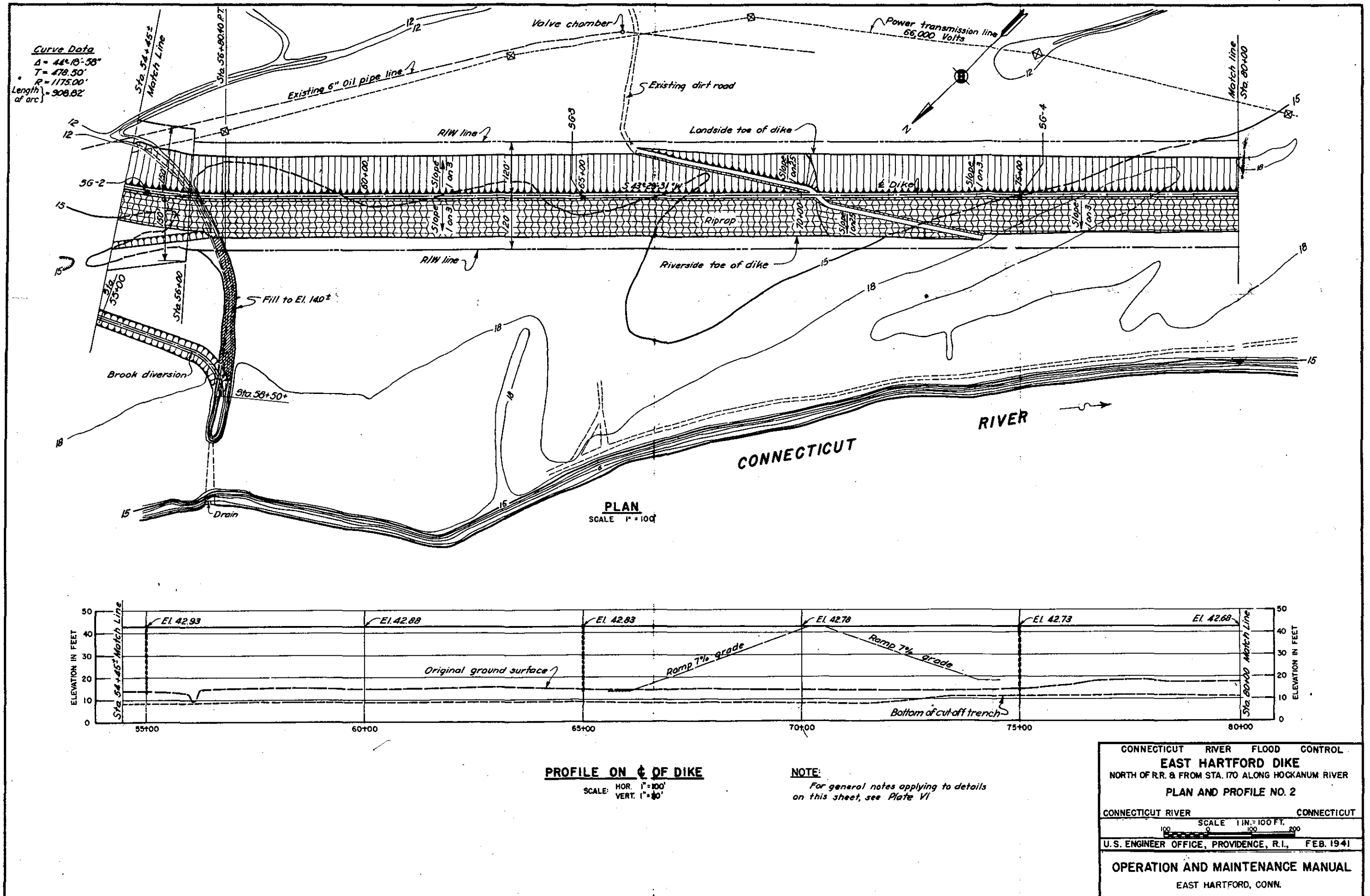
**PROFILE ON & OF BROOK DIVERSION**

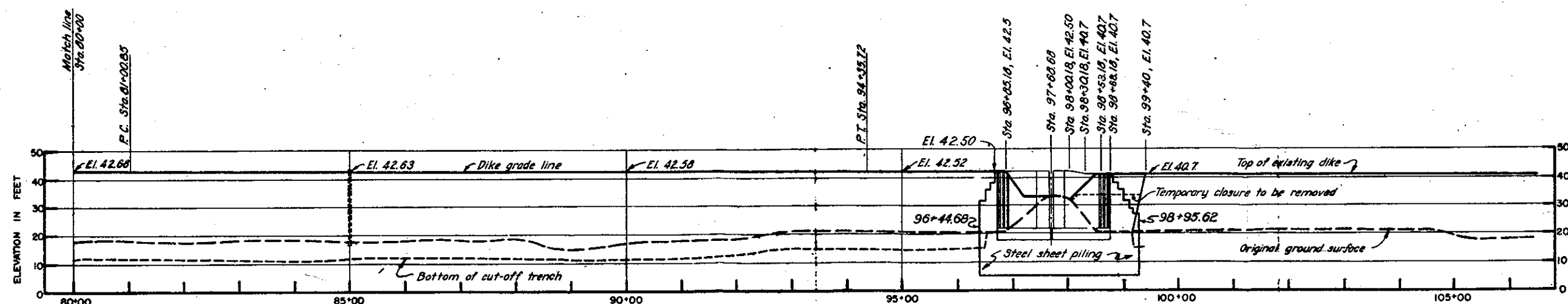
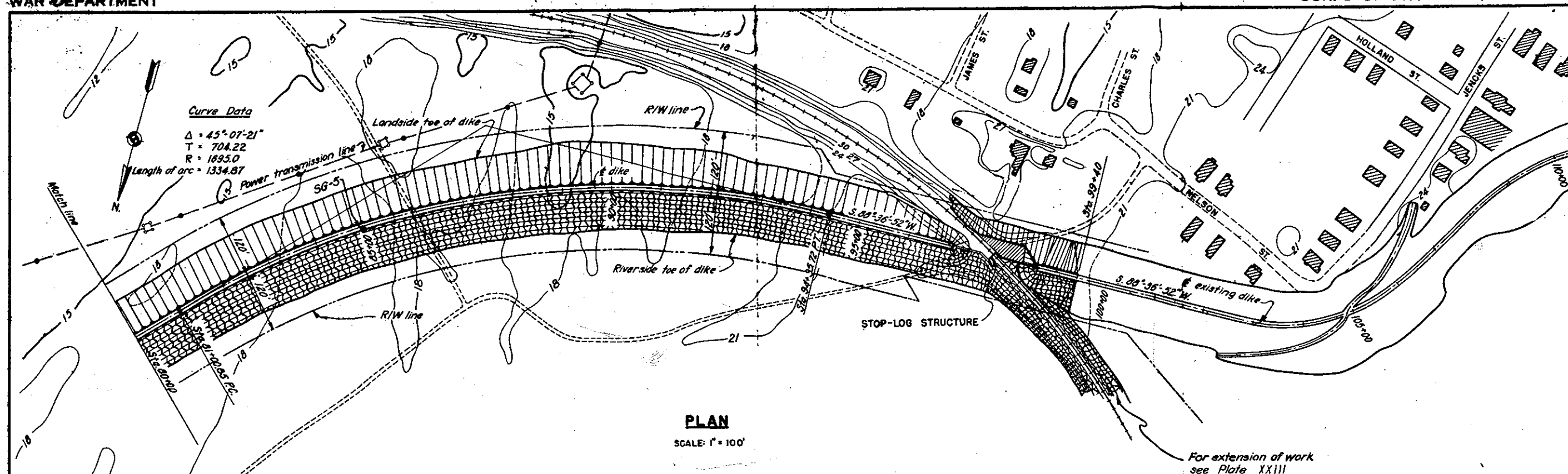
SCALE: HOR. 1"=100'  
VERT. 1"=20'

#### NOTES

Elevations refer to Mean Sea Level Datum.  
S.G. denotes settlement gage.

CONNECTICUT RIVER FLOOD CONTROL	
<b>EAST HARTFORD DIKE</b>	
NORTH OF R.R. & FROM STA. 170 ALONG HOCKANUM RIVER	
PLAN AND PROFILE NO. 1	
CONNECTICUT RIVER	CONNECTICUT
SCALE: 1 IN. = 100 FT.	
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., FEB. 1941	
<b>OPERATION AND MAINTENANCE MANUAL</b>	
EAST HARTFORD, CONN.	



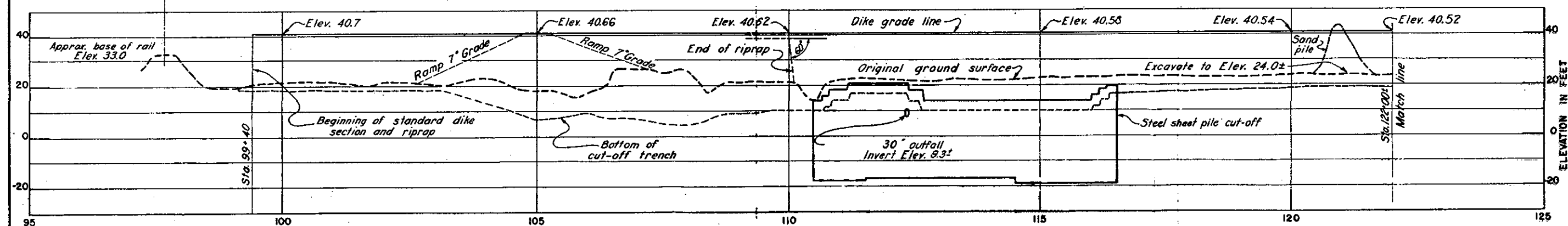
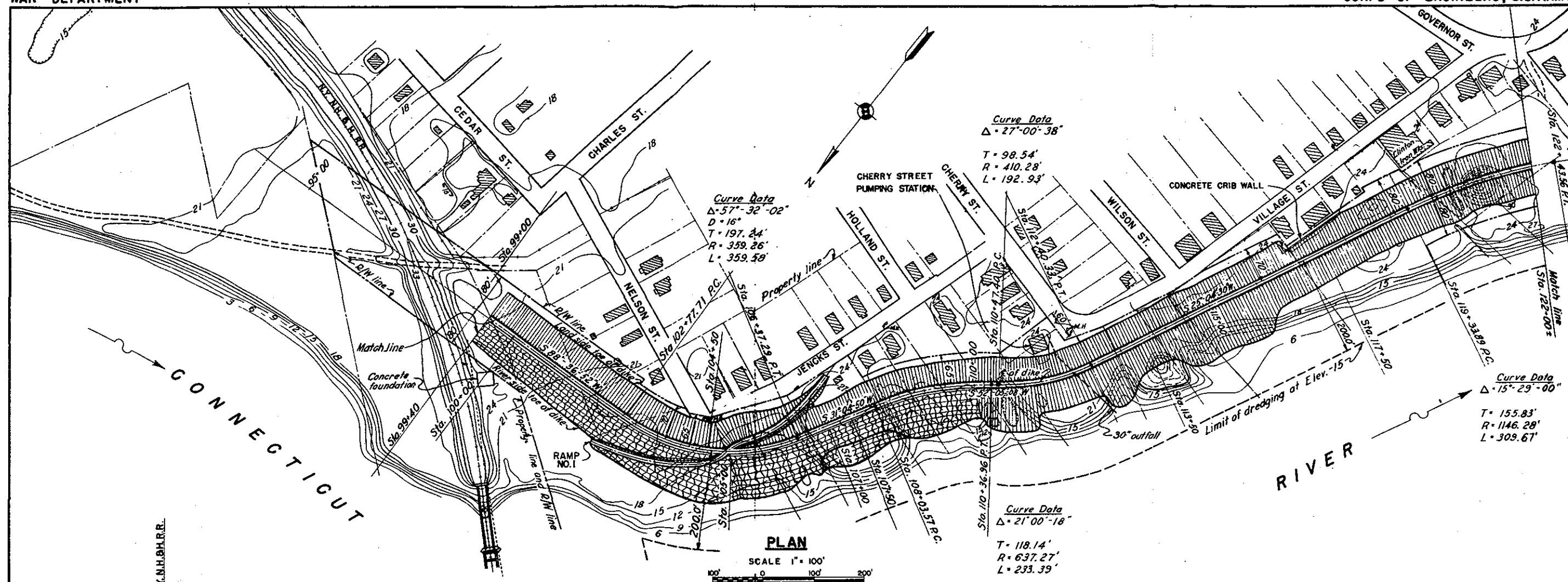


**NOTES**

For general notes applying to details on this sheet, see Plate VI

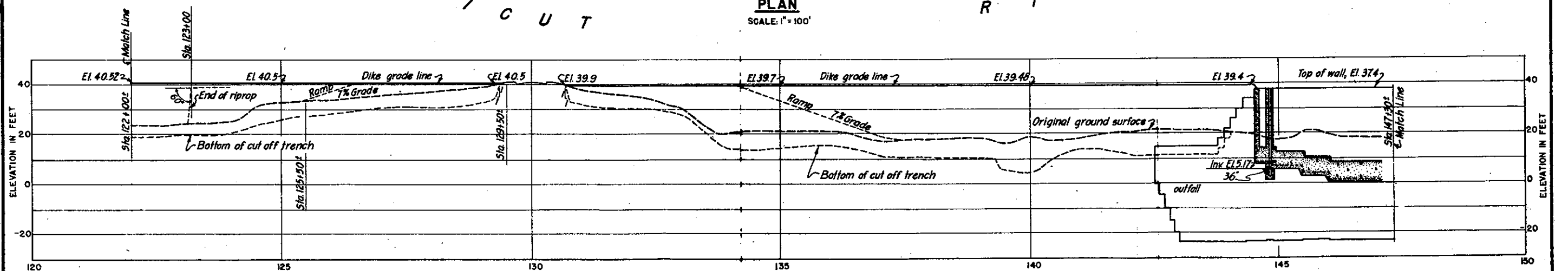
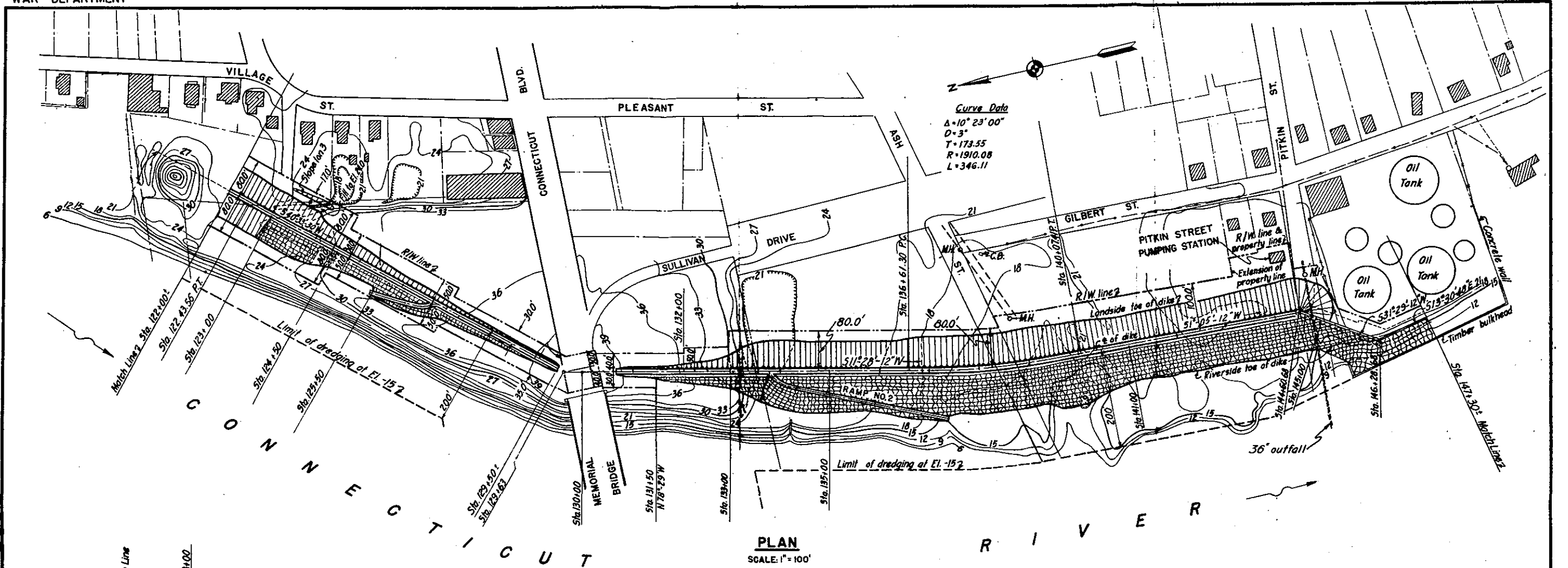
CONNECTICUT RIVER FLOOD CONTROL	
<b>EAST HARTFORD DIKE</b>	
NORTH OF R.R. & FROM STA. 170 ALONG HOCKANUM RIVER	
<b>PLAN AND PROFILE NO. 3</b>	
CONNECTICUT RIVER	CONNECTICUT
SCALE: 1 IN. = 100 FT.	
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., FEB. 1941	
<b>OPERATION AND MAINTENANCE MANUAL</b>	
EAST HARTFORD, CONN.	



**NOTES**

Elevations refer to Mean Sea Level Datum.

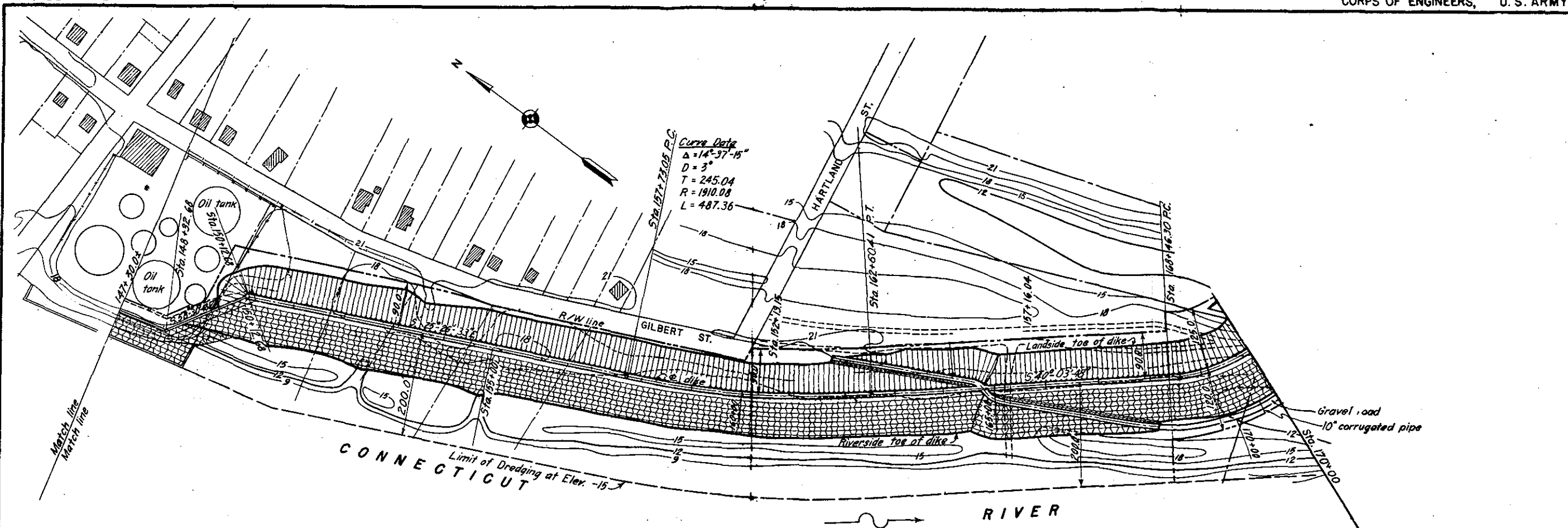
CONNECTICUT RIVER FLOOD CONTROL	
<b>EAST HARTFORD DIKE</b>	
FISCAL YEAR 1939 SECTION	
PLAN AND PROFILE NO. 4	
CONNECTICUT RIVER,	CONNECTICUT
SCALE: 1 IN. = 100 FT.	
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MARCH 1939	
<b>OPERATION AND MAINTENANCE MANUAL</b>	
EAST HARTFORD, CONN.	



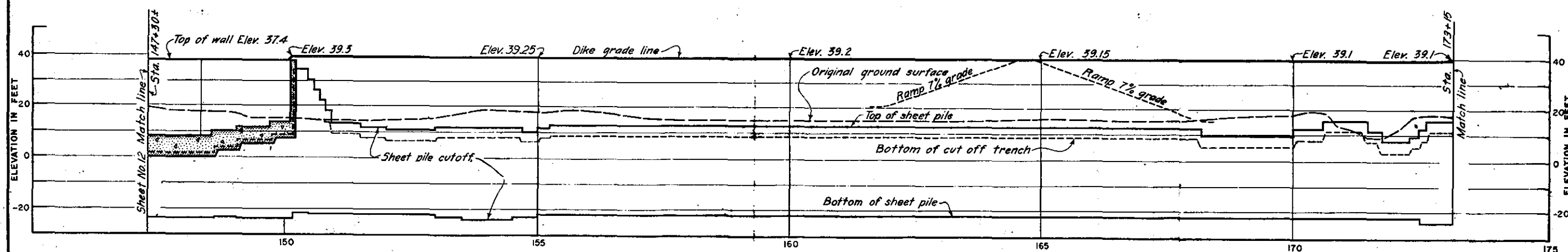
**NOTES**

For general notes applying to details on this sheet, see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL	
EAST HARTFORD DIKE	
FISCAL YEAR 1939 SECTION	
PLAN AND PROFILE NO. 5	
CONNECTICUT RIVER	CONNECTICUT
SCALE: 1 IN. = 100 FT.	
U. S. ENGINEER OFFICE, PROVIDENCE, R. I. MARCH 1939	
OPERATION AND MAINTENANCE MANUAL	
EAST HARTFORD, CONN.	



**PLAN**  
 SCALE: 1" = 100'



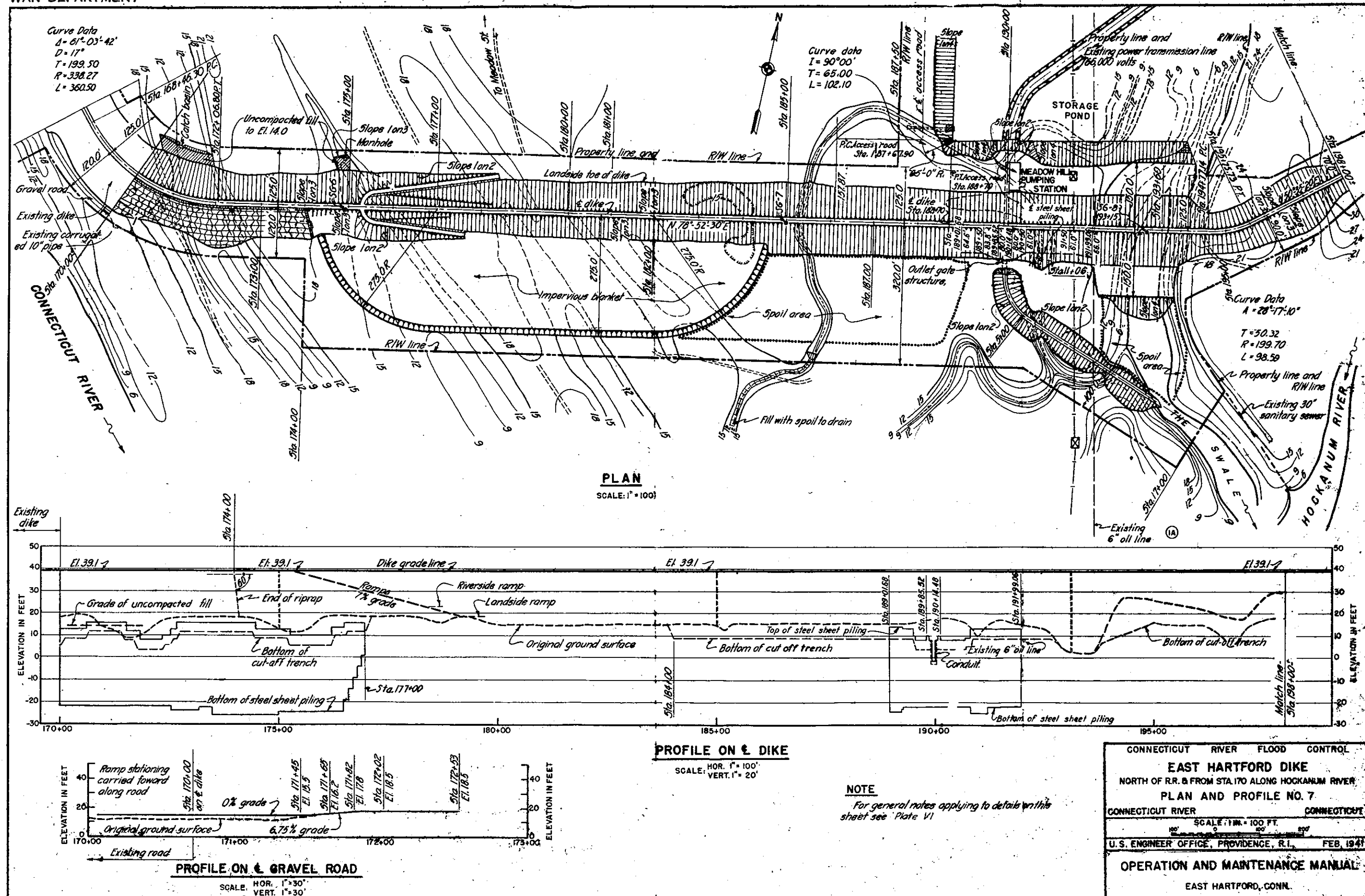
**PROFILE ON DIKE**

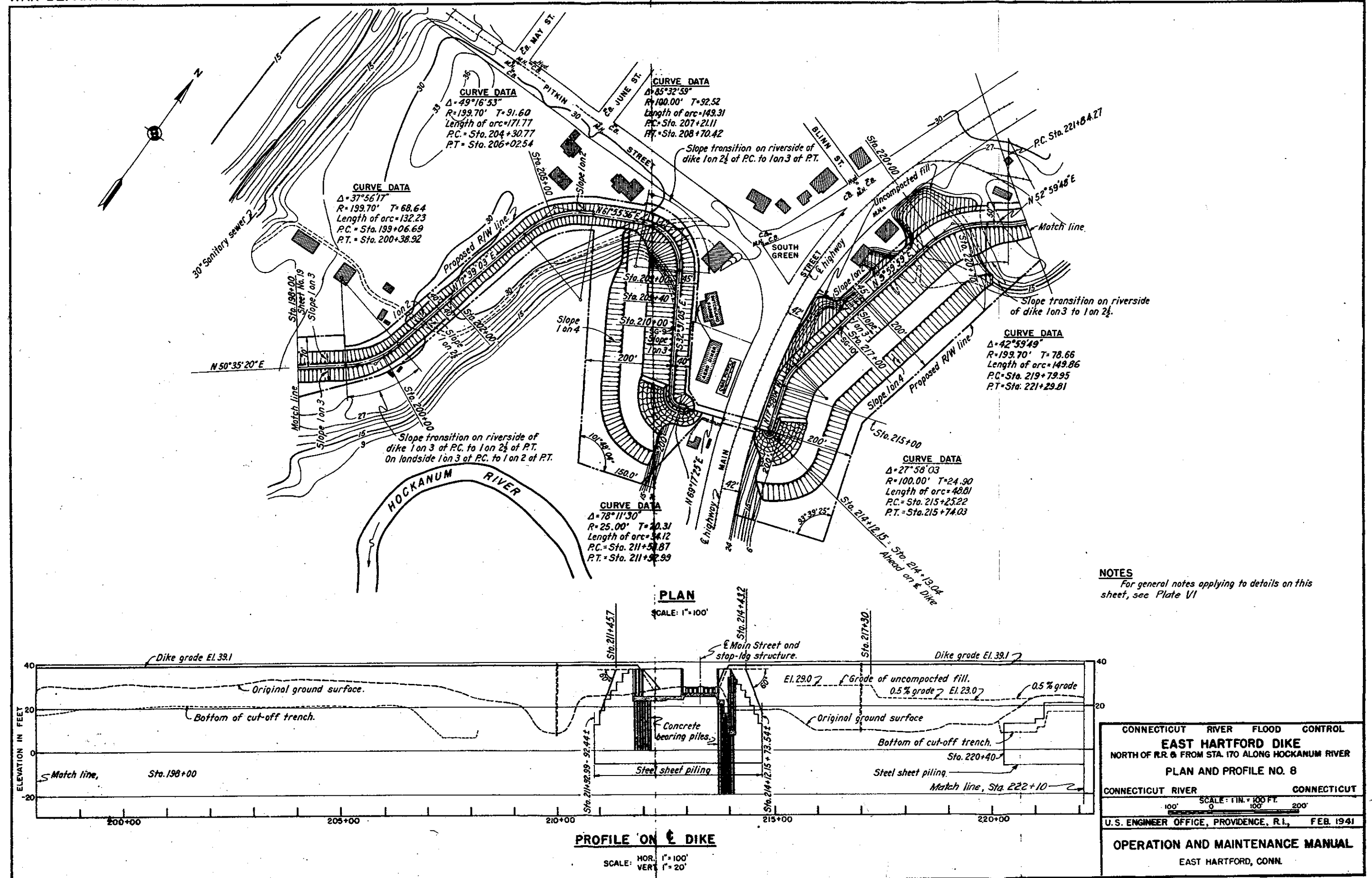
SCALE: HOR. 1" = 100'  
 VERT. 1" = 20'

**NOTES**

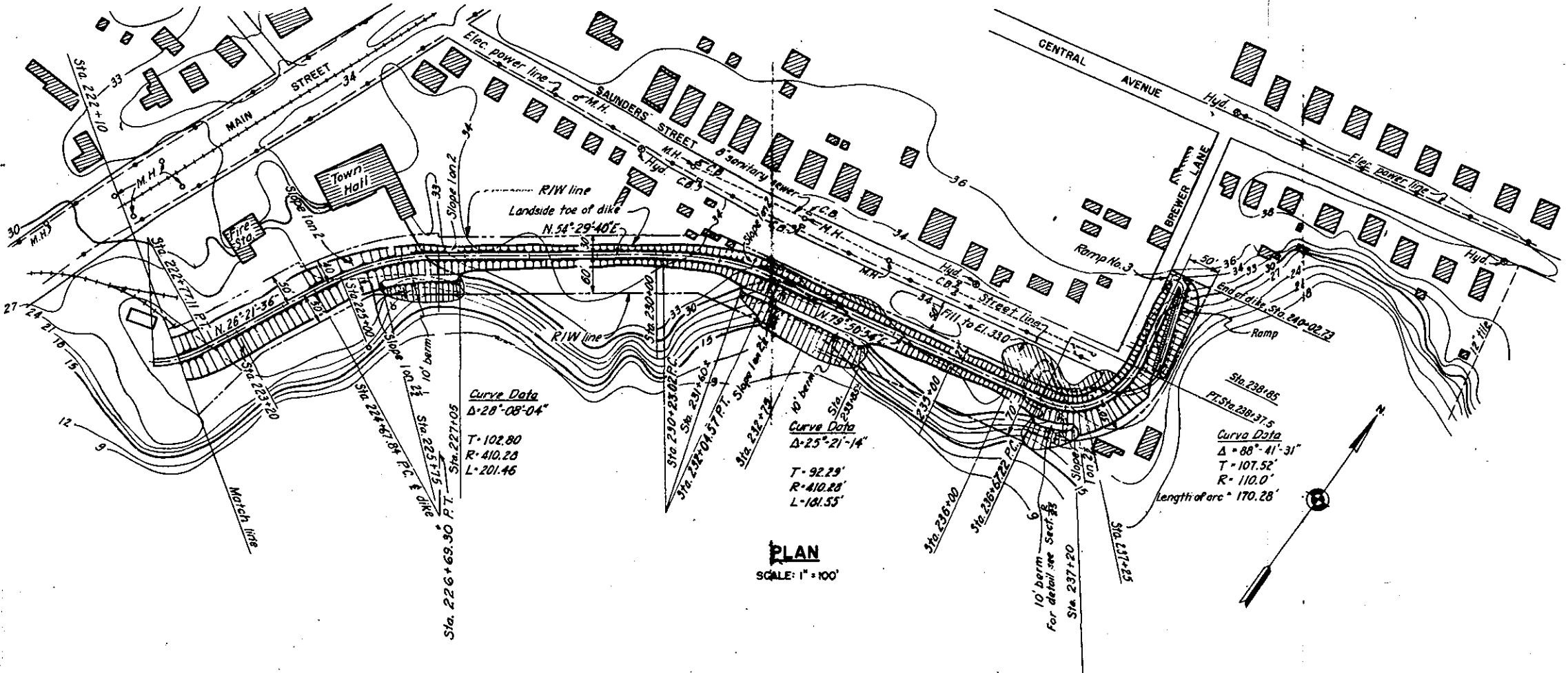
For general notes applying to details on this sheet, see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL	
EAST HARTFORD DIKE	
FISCAL YEAR 1939 SECTION	
PLAN AND PROFILE NO. 6	
CONNECTICUT RIVER	CONNECTICUT
SCALE: 1" = 100 FT.	
U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MARCH 1939	
OPERATION AND MAINTENANCE MANUAL	
EAST HARTFORD, CONN.	

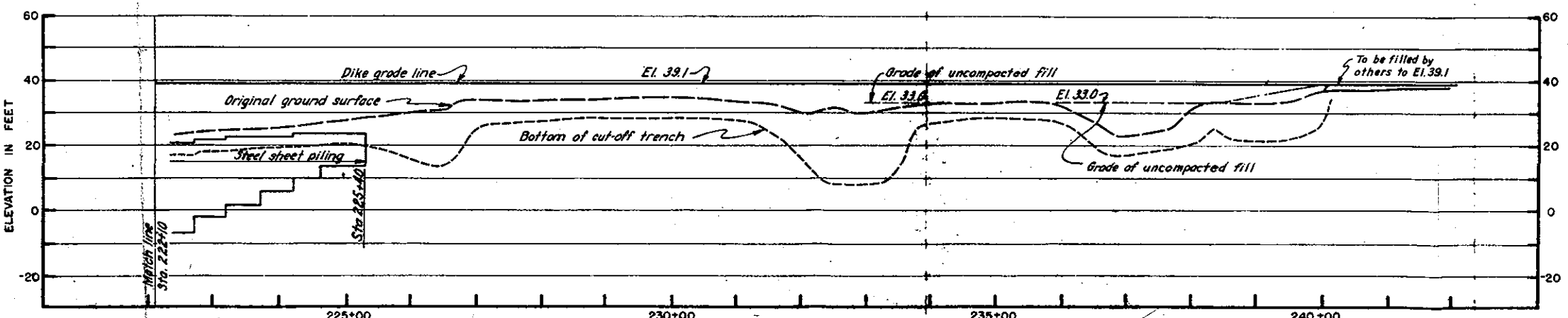




Curve Data  
 $\Delta = 26^\circ - 38' - 12''$   
 $T = 47.27$   
 $R = 199.70$   
 $L = 92.84'$



PLAN  
SCALE: 1" = 100'



PROFILE ON DIKE  
SCALE: HOR. 1" = 100'  
VERT. 1" = 20'

NOTES  
For general notes applying to details on this sheet see Plate VI.

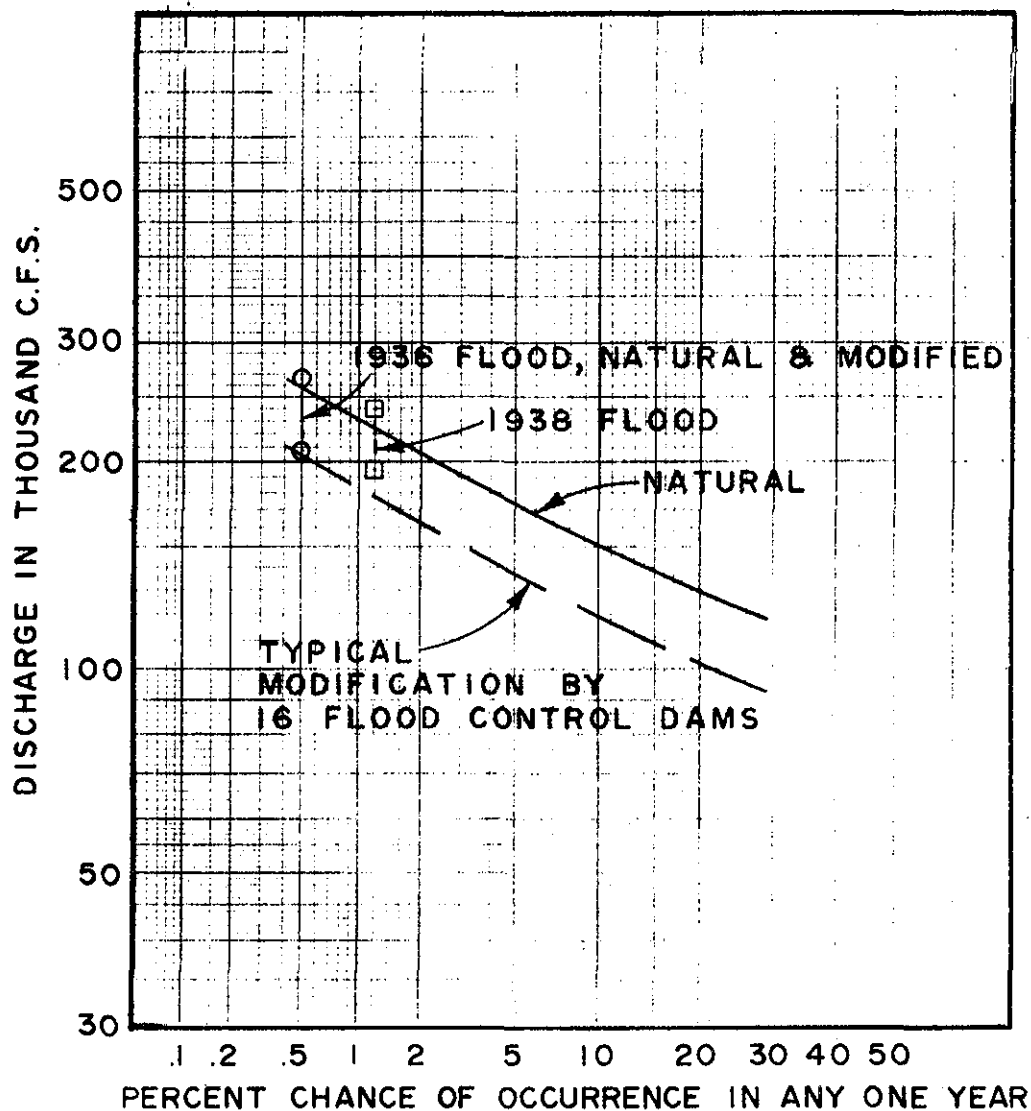
CONNECTICUT RIVER FLOOD CONTROL  
**EAST HARTFORD DIKE**  
NORTH OF R.R. & FROM STA. 170 ALONG HOCKANUM RIVER  
**PLAN AND PROFILE NO. 9**

CONNECTICUT RIVER CONNECTICUT

SCALE: 1 IN. = 100 FT.

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., FEB. 1941

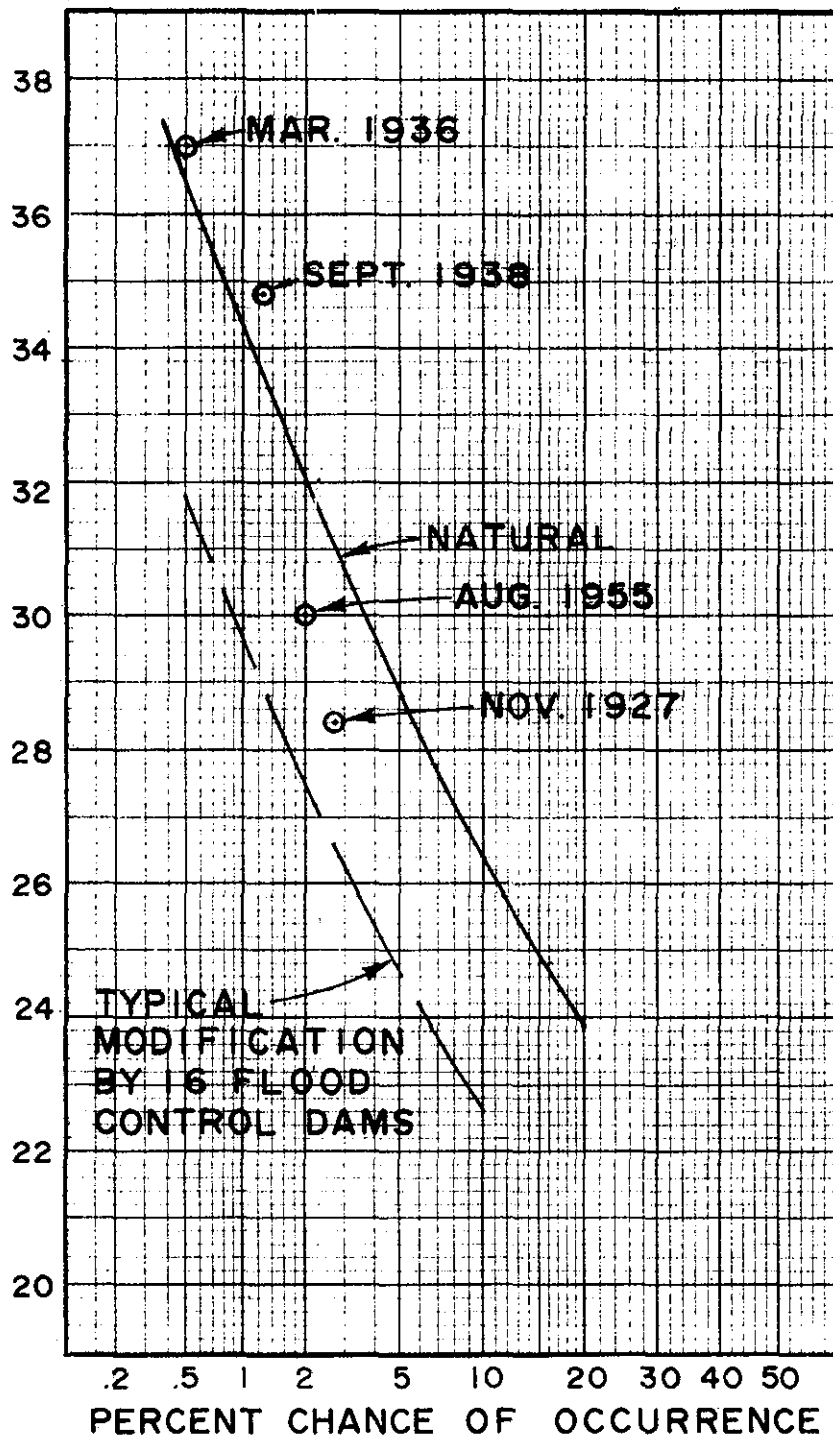
**OPERATION AND MAINTENANCE MANUAL**  
EAST HARTFORD, CONN.



CONNECTICUT RIVER  
DISCHARGE FREQUENCY  
CURVE AT  
MIDDLETOWN, CONNECTICUT

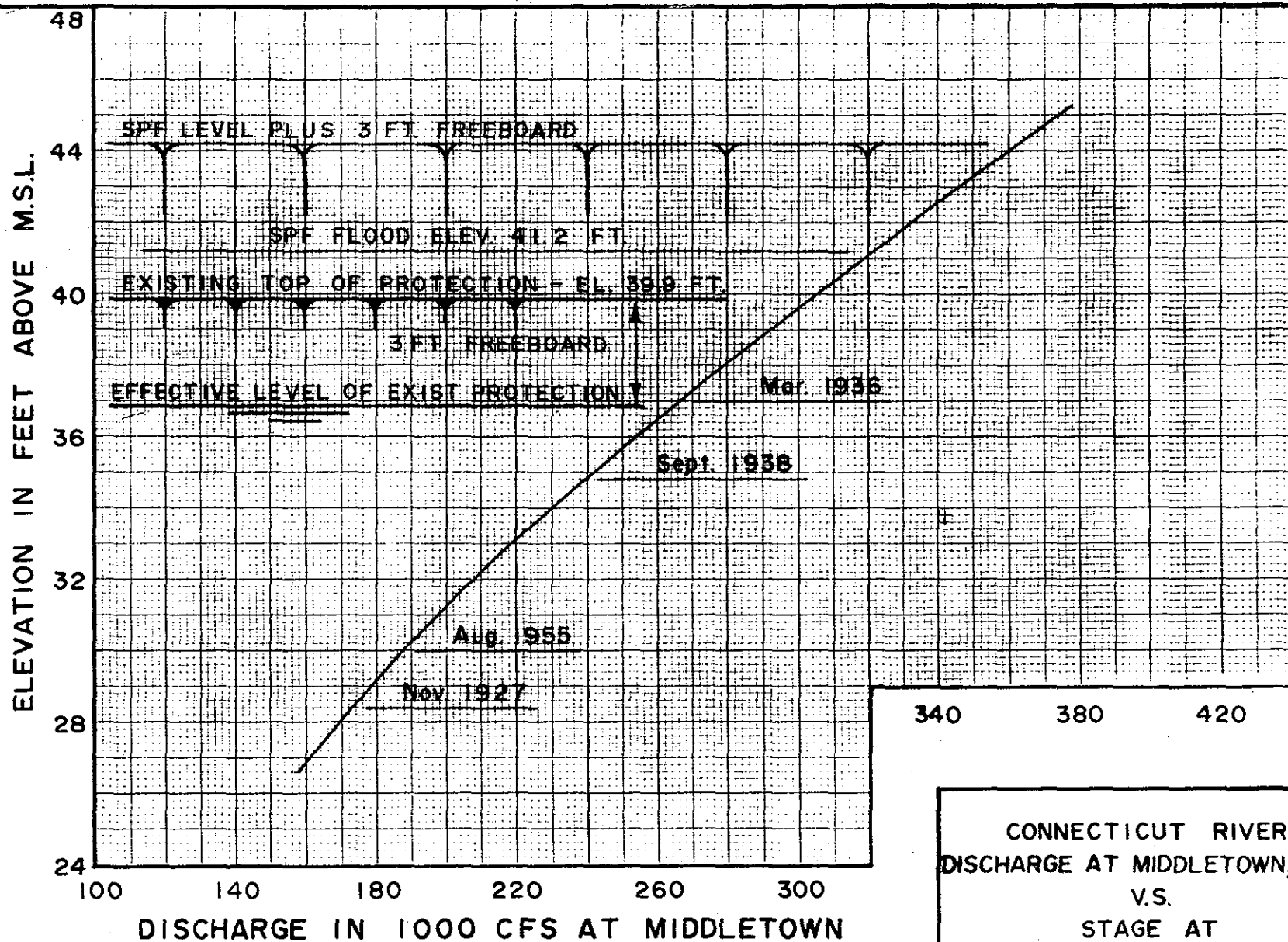


CONNECTICUT RIVER AT EAST HARTFORD MEMORIAL BRIDGE  
ELEVATION IN FEET ABOVE M.S.L.



CONNECTICUT RIVER  
ELEVATION FREQUENCY  
CURVE  
HARTFORD MEMORIAL BRIDGE





CONNECTICUT RIVER  
DISCHARGE AT MIDDLETOWN, CONN.  
V.S.  
STAGE AT  
HARTFORD MEMORIAL BRIDGE

## APPENDIX 1: STUDY ANNOUNCEMENT



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154

REPLY TO  
ATTENTION OF:  
NEDPL-P

30 December 1976

ANNOUNCEMENT OF INITIATION OF A STUDY

TO

DETERMINE THE FEASIBILITY OF RAISING  
THE EXISTING FLOOD CONTROL DIKES

IN

EAST HARTFORD, CONNECTICUT

The New England Division, Army Corps of Engineers, announces the initiation of a study to determine the feasibility of raising the existing dikes to provide a higher degree of flood protection for the highly developed sections of East Hartford. The primary purpose of this announcement is to provide all interested parties with the opportunity to submit their views and opinions concerning the proposal early in the planning stage to insure that the needs and desires of the public are incorporated wherever possible.

The report of the Connecticut River Comprehensive Study published by the Corps of Engineers in 1970 recommended the construction of seven additional reservoirs to supplement the existing 16 reservoirs and seven mainstem Connecticut River local protection projects in order to provide the desired level of flood protection. Since 1970 the Basin States have withdrawn their support of the seven additional reservoirs as a means of providing the needed level of protection in six mainstem urban communities (including East Hartford) which now have local protection projects. The New England River Basin Commission in its revised draft study report, the River's Reach, recommended that this study be made.

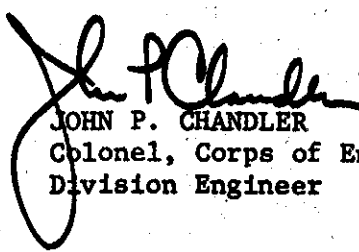
The East Hartford local protection project is located along the east bank of the Connecticut River, 52 miles above its mouth. The project provides protection for about 760 acres of residential, commercial, industrial and public property within East Hartford. Completed in 1943, it is now operated and maintained by the town of East Hartford. The completed works consist of dikes, walls, stoplog structures, pumping stations and other facilities. There are about 19,000 feet of earth dikes and 750 feet of concrete floodwalls along the Connecticut and Hockanum Rivers, extending from the high ground near Greene Terrace in the north to high ground at Brewer Lane and Central Avenue in the south. The total cost of the project was \$2,405,000 of which \$270,000 was non-Federal expense. Past operations have prevented over 7.5 million dollars in flood damages.

30 December 1976

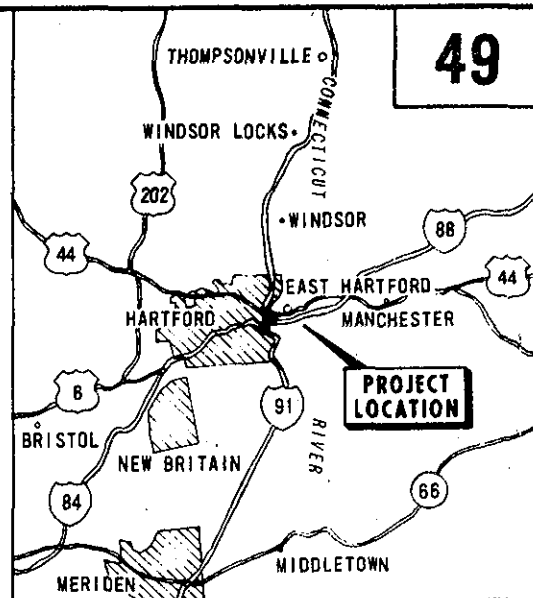
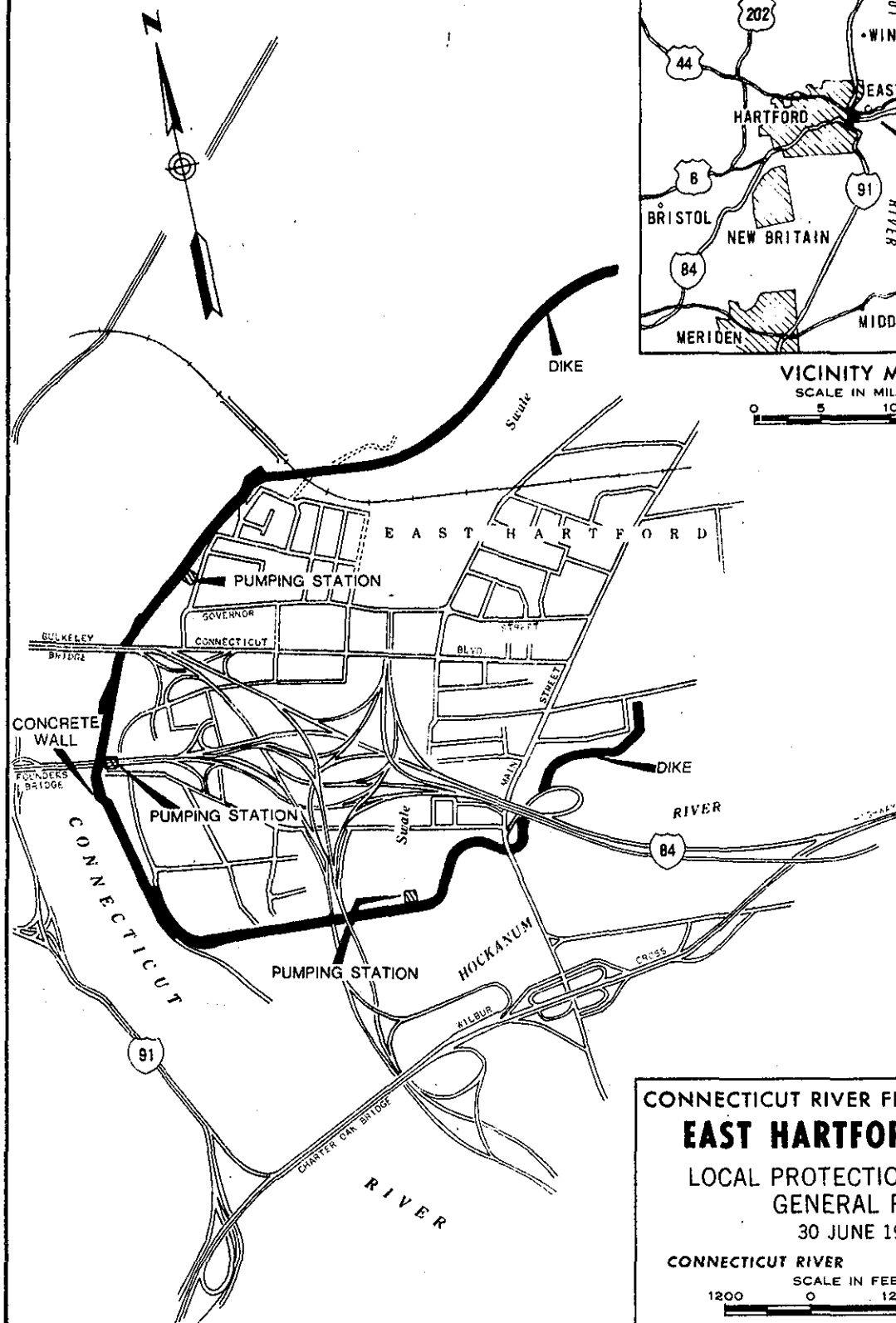
This study will investigate the engineering feasibility, economic justification, environmental and social effects of modifying the existing local protection project to attain a higher degree of flood protection. The first stage of the study will concentrate on problem identification. It is essential that all potential problems, needs and desires of the community surface now to insure early consideration during the planning process. Subsequent to this primary stage of the study, alternatives will be formulated, evaluated and presented at a public information meeting during the fall of 1977.

A preliminary mailing list has been developed. If you know of others with an interest in this project please make this notice known to them. Comments concerning this study and requests to be added to the mailing list may be made at any time by writing to:

Division Engineer  
U.S. Army Corps of Engineers  
New England Division  
424 Trapelo Road  
Waltham, MA 02154



JOHN P. CHANDLER  
Colonel, Corps of Engineers  
Division Engineer



VICINITY MAP

SCALE IN MILES



CONNECTICUT RIVER FLOOD CONTROL

**EAST HARTFORD CONN.**

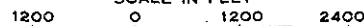
LOCAL PROTECTION PROJECT  
GENERAL PLAN

30 JUNE 1975

CONNECTICUT RIVER

CONNECTICUT

SCALE IN FEET



NEW ENGLAND DIVISION

WALTHAM, MASS.

MAILING LIST

ANNOUNCEMENT OF INITIATION OF A STUDY  
TO  
DETERMINE THE FEASIBILITY OF RAISING THE EXISTING FLOOD CONTROL DIKES  
IN EAST HARTFORD, CONNECTICUT  
30 DECEMBER 1976

CONGRESSIONAL

Hon. Abraham Ribicoff, United States Senate, Washington, DC 20515

Hon. Lowell P. Weicker, Jr., United States Senate, Washington, DC 20515

Hon. Lowell P. Weicker, Jr., Federal Court House, 915 Lafayette Blvd.,  
Bridgeport, CT 06603

Hon. William R. Cotter, House of Representatives, Washington, DC 20515

Hon. William R. Cotter, Federal Bldg., 450 Main Street, Hartford, CT 06103

GOVERNOR

Hon. Ella T. Grasso, Governor of the State of Connecticut, State House,  
Hartford, CT 06103

CONNECTICUT LEGISLATORS

STATE SENATORS

Hon. George W. Hannon, Jr., Connecticut Senate, 45 Connecticut Blvd.,  
East Hartford, CT 06108

STATE REPRESENTATIVES

Hon. Timothy J. Moynihan, Conn. House of Representatives, 190 Naubuc Ave.,  
East Hartford, CT 06118

Hon. Richard C. Willard, Conn. House of Representatives, 42 Russel Drive,  
East Hartford, CT 06108

Hon. Muriel Yacavone, Conn. House of Representatives, 1976 Wakefield Circle,  
East Hartford, CT 06118

FEDERAL INTERESTS

Office of the Chief of Engineers, HQDA (DAEN-CWP-E), James Forrestal Bldg,  
Washington, DC 20314

Resident Member, Board of Engineers for Rivers and Harbors,  
Kingman Building, Fort Belvoir, VA 22060

Director, Coastal Engineering Research Center, Kingman Building,  
Fort Belvoir, VA 22060

Director, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631,  
Vicksburg, Mississippi 39181

Director, Institute for Water Resources, Corps of Engineers,  
 Kingman Building, Fort Belvoir, VA 22060  
 Mr. Frank R. Gregg, Chairman, New England River Basins Commission,  
 Room 205, 55 Court Street, Boston, MA 02108  
 Chairman, New England Regional Commission, 53 State Street, Boston, MA  
 02108  
 The Administrator, Soil Conservation Service, U.S. Dept. of Agriculture,  
 Washington, DC 20250  
 Department of Agriculture Representative, Northeast Resources Committee,  
 Soil Conservation Service, U.S. Dept. of Agriculture, 7600 West  
 Chester Pike, Upper Darby, PA 19082  
 Regional Forester and Area Director, Forest Service, U.S. Dept of  
 Agriculture, 6816 Market Street, Upper Darby, PA 19082  
 Water Resources Coordinator, Dept. of Commerce, 6010 Executive Blvd.,  
 Rockville, MD 20852  
 Director, Boston Business Service Field Office, Bureau of Domestic  
 Commerce, 441 Stuart Street, Boston, MA 02116  
 Assistant Secretary for Economic Development, Dept. of Commerce,  
 Washington, DC 20230  
 Regional Director, Atlantic Regional Office, Economic Development  
 Administration, 320 Walnut Street, Philadelphia, PA 19106  
 Associate Director, Hydrology, National Weather Service, Office of  
 Hydrology (W2), NOAA, Dept. of Commerce, Silver Spring, MD 20930  
 Regional Hydrologist, Eastern Region, NOAA National Weather Service,  
 Dept. of Commerce, 585 Stewart Avenue, Garden City, NY 11530  
 Director, Atlantic Marine Center, National Ocean Survey, NOAA, U.S.  
 Dept. of Commerce, Federal Bldg., 14 Elm Street, Gloucester, MA 01930  
 Regional Economics Division, Office of Business Economics, U.S. Dept.  
 of Commerce, Washington, DC 20230  
 The Surgeon General, USPHS/DHEW, 330 Independence Avenue, SW,  
 Washington, DC 20201  
 Regional Director, PHS Region 1, DHEW, JFK Federal Bldg., Boston, MA 02203  
 Regional Administrator, Region 1, U.S. Dept. of Housing and Urban  
 Development, Room 800, JFK Federal Bldg., Boston, MA 02203  
 Regional Coordinator, Northeast Region, U.S. Dept. of Interior,  
 2003 J JFK Federal Bldg., Boston, MA 02203  
 Chief, Eastern Field Operation Center, Bureau of Mines, U.S. Dept of  
 Interior, 4800 Forbes Avenue, Pittsburgh, PA 15213  
 Regional Director, Northeast Region, Bureau of Outdoor Recreation,  
 U.S. Dept. of Interior, Federal Bldg, 600 Arch Street, Philadelphia,  
 PA 19106  
 Regional Director, Region 5, Bureau of Sport Fisheries and Wildlife,  
 U.S. Dept. of Interior, U.S. Post Office and Courthouse, Boston  
 MA 02109  
 Chief Hydrologist, Geological Survey, U.S. Dept. of Interior, Washington,  
 DC 20242  
 Regional Hydrologist, Geological Survey, National Center, Mail Stop #433.  
 Reston, VA 22092  
 Director, National Park Service, North Atlantic Region, 150 Causeway St.  
 Boston, MA 02114

Director, Office of Water Resources Research, Dept. of Interior  
 Washington, DC 20240  
 DOT Coordinator for Water Resources, U.S. Dept. of Transportation  
 (AWL/83), 400 Seventh Street, SW, Washington, DC 20591  
 Administrator, Federal Highway Administration, Bridge Division-HN6-31  
 400 Seventh Street, S.W. Washington, DC 20591  
 Regional Federal Highway Administrator, Region 1, 4 Normanskill Blvd.,  
 Delmar, NY 12054  
 Administrator, Federal Railroad Administration, U.S. Dept. of  
 Transportation, 400 Seventh Street, S.W. Washington, DC 20591  
 Director, Office of Policy and Planning, Federal Railroad Administration,  
 U.S. Dept of Transportation, 400 Seventh Street, S.W. Washington,  
 DC 20591  
 Regional Director, Region 1, Federal Building Administration,  
 U.S. Dept. of Transportation, JFK Federal Bldg., Room # 309,  
 Boston, MA 02203  
 The Administrator, Environmental Protection Agency, Waterside Mall,  
 4th and M Streets, S.W., Washington, DC 20460  
 Regional Administrator, Region 1, EPA 2303 JFK Federal Bldg.,  
 Boston, MA 02203  
 Chief, Bureau of Power, Federal Power Commission, Washington, DC 20426  
 Regional Engineer, Federal Power Commission, Room 2207,  
 26 Federal Plaza, New York, NY 10007  
 Chairman, Council on Environmental Quality, 722 Jackson Place, N.W.  
 Washington, DC 20006  
 U.S. Department of Agriculture, Soil Conservation Service,  
 29 Cottage Street, Amherst, MA 01002  
 U.S. Department of Agriculture, Soil Conservation Service, Mansfield  
 Professional Park, Storrs, CT 06268  
 U.S. Department of Agriculture, Soil Conservation Service, Federal Bldg.,  
 Durham, NH 03824

#### CONNECTICUT OFFICIALS, INTERESTED GROUPS AND INDIVIDUALS

Mr. Harold I. Ames, Director for Planning, Planning & Budgeting Division,  
 Dept. of Finance and Control, 340 Capitol Avenue, Hartford, CT 06115  
 League of Women Voters of Connecticut, 60 Connolly Parkway, Hamden, CT 06514  
 Mr. William C. Kennard, Director, Institute for Water Resources,  
 University of Connecticut, Storrs, CT 06268  
 Connecticut Dept. of Public Health, 79 Elm Street, Hartford, CT 06115  
 Chairman, Capitol Region Planning Agency, 15 Lewis Street, Hartford, CT 06103  
 Mr. Harold I. Ames, Administrator, Connecticut Interregional Planning  
 Program, 165 Capitol Avenue, Hartford, CT 06115  
 Mr. Stanley Pac, Commissioner, Dept. of Environmental Protection,  
 State of Connecticut, State Office Bldg., Hartford, CT 06101  
 Mr. R.J. Grosch, Division Engineer, Metropolitan District, Hartford  
 Plaza, P.O. Box 300, Hartford, CT 06101  
 Mr. Arthur J. Mulligan, Director of Public Works, Town of East Hartford,  
 East Hartford, CT 06108  
 Mr. Harry Ravelese, 17 Sawka Drive, East Hartford, CT 06118



Mrs. Eleanor Wolfe, Secretary, Great Meadows Trust, 400 Hartford Avenue,  
 Wethersfield, CT 06109  
 Ms. Astrid Hanzalek, 155 St. Main, Suffield, CT 06078  
 Mr. Dave Harrison, Manager, Connecticut River Basin Office,  
 New England River Basins Commission, P.O. Box 651, 9 South Main St.,  
 Hanover, N.H. 03755  
 Mr. Peter J. Revill, Chief, Designing Engineer, Metropolitan District  
 Water Bureau, Hartford Plaza, P.O. Box 300, Hartford, CT 06101  
 Ms. Pat Felton, 14 School Street, East Hartford, CT 06103  
 Director, Northeast Region, National Park Service, Dept. of Interior  
 143 South Third St., Philadelphia, PA 19106  
 Regional Director National Marine Fisheries Service, U.S. Dept. of  
 Commerce, Federal Bldg., 14 Elm Street, Gloucester, MA 01930  
 Regional Engineer, Federal Power Commission, Room 2207, 26 Federal  
 Plaza, New York, NY 10007  
 Mr. Allan Williams, Natural Resources Center, Dept of Environmental Protection,  
 State Office Bldg., Room 553, Hartford, CT 06115  
 Mr. Leonard D. Tolisano, 97 Elm Street, Hartford, CT 06106  
 Mr. Philip C. Smith, Executive Director, Connecticut Properties Review Board  
 State Office Building, 165 Capitol Avenue, Hartford, CT 06115  
 Mr. Charles Sheehan, Town Engineer, East Hartford  
 Mr. David Lavine, Dead Hill Road, Durham, CT 06422  
 Mr. David A. Gillette, 336 Palisado Avenue, Windsor, CT 06095  
 Mr. Christopher Percy, President Conn. River Watershed Council, 125 Combs  
 Road, Easthampton, MA 01027  
 Mr. Evon Kochev, 8A Bushnell Plaza, Gold Street, Hartford, CT 06106  
 Mr. F. Walker Johnson, Putnam Green, Apt. 36-F, Greenwich, CT 06830  
 Mr. John J. Logan, Assistant Vice President, Connecticut Bank & Trust Co.,  
 1 Constitution Plaza, Hartford, CT 06115  
 Ms. Barbara Maynard, First Selectman, Old Saybrook, CT 06475  
 Mr. Clyde O. Fisher, Jr., 76 North Beacon Street, Hartford, CT 06105  
 Mr. Astrid T. Hanzalek, 155 South Main Street, Suffield, CT 06078  
 Mr. Ellsworth Grant, 134 Steele Road, West Hartford, CT 06119  
 Mr. Richard J. Dalphin, Associate Professor of Civil University of Hartford  
 Engineering, 200 Bloomfield Avenue, West Hartford, CT 06117  
 Mr. Paul Bock, Professor of Engineering, University of Connecticut,  
 Storrs, CT 06268  
 Mr. Thomas Sharpless, University of Hartford, 200 Bloomfield Avenue,  
 West Hartford, CT 06117  
 Mr. Victor Scottron, Professor & Director, Institute of Water Resources,  
 University of Connecticut, Storrs, CT 06268  
 Mr. William Boyd, Essex Marine Laboratory, Essex, CT 06426  
 Mr. Gregory S. Horne, Chairman, Dept. Earth & Environmental Science,  
 Wesleyan University, Middletown, CT 06457  
 Mr. Dana Hanson, Director, Len Tolisano, Chief of Planning, Capitol Region  
 Council of Governments, 97 Elm Street, Hartford, CT 06103

## APPENDIX 2: LETTERS OF COMMENT

# TOWN OF EAST HARTFORD

*East Hartford, Connecticut 06108*



OFFICE OF THE MAYOR

July 19, 1974

Col. John H. Mason  
Department of the Army  
New England Division, Corps of Engineers  
424 Trapelo Road  
Waltham, Mass. 02154

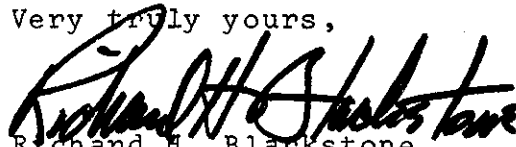
Dear Col. Mason:

Please consider this a letter of intent stating that the Town of East Hartford desires the initiation of a feasibility study by the Corps of Engineers of the possible raising of the East Hartford Dike System.

Be confident in the fact that our Director of Public Works, Arthur Mulligan will make every attempt to assure any local cooperation that may be found necessary.

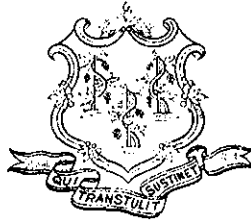
Our Public Works Department awaits further correspondence.

Very truly yours,

  
Richard H. Blackstone  
Mayor

RHB;mt

ELLA GRASSO  
GOVERNOR



STATE OF CONNECTICUT  
EXECUTIVE CHAMBERS  
HARTFORD

January 12, 1977

Colonel John P. Chandler  
Corps of Engineers  
Department of the Army  
New England Division  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Colonel Chandler:

Thank you for sending me an advance copy of the study announcement for the East Hartford Local Protection Project.

I have forwarded the material to Commissioner Stanley J. Pac of the Department of Environmental Protection for his review and consideration.

Your courtesy is appreciated.

With best wishes,

Cordially,

A handwritten signature in cursive script that reads "Ella Grasso".

ELLA GRASSO  
Governor



STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING

HARTFORD, CONNECTICUT 06115



January 24, 1977

Colonel John P. Chandler  
U.S. Army Corps of Engineers  
New England Division  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Colonel Chandler:

We are pleased to receive your advanced announcement of the impending Connecticut River Flood Control Study.

The Department is concerned that the issue of upstream or downstream effects associated with raising the East Hartford dikes and flood walls be fully addressed.

It is our desire to maintain a close working relationship with the Corps on this project, and we are requesting that the Director of our Water Resources Unit, Mr. Edward J. Daly, be kept abreast of the progress of the study.

We look forward to working with you in the future.

Sincerely,

*Stanley J. Pac*  
Stanley J. Pac  
Commissioner

SJP:jbo

Water Resources Unit  
Telephone No. 566-7245

6-CAG/dc

## THE METROPOLITAN DISTRICT

HARTFORD PLAZA - P. O. BOX 800

HARTFORD, CONN. 06101

January 25, 1977

Feasibility Study of Raising  
The Existing Flood Control Dikes  
in East Hartford, Connecticut

172

Colonel John P. Chandler  
Division Engineer  
U. S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Colonel Chandler:

This letter is in response to your December 30, 1976 announcement in which you request comments on your study to determine the feasibility of raising the existing dikes in East Hartford.

The Water Bureau of The Metropolitan District has a 36-inch pre-stressed concrete pipe transmission main crossing the Connecticut River about 3,800 feet north of the Penn Central Railroad bridge. This main runs parallel to the East Hartford Dike to Floradale Drive in East Hartford. Enclosed are copies of four drawings entitled Northeast Transmission Main showing this main and the area of concern.

While the location of the main may not be a problem in any dike raising, we feel that it is very important for the Corps to be aware of its existence and exact location.

If you have any questions or comments on this matter, please contact this office.

Sincerely,



Albert Helt,  
Deputy Manager - Water Engineering  
THE WATER BUREAU

Enc: 1 set (Acc. 4791, 4793-4795)

cc: A. Helt, Deputy Manager - Water Engineering  
C. A. Garritt, Assistant Chief Designing Engineer  
P. J. Revill, Chief Designing Engineer (2)

# CBT THE CONNECTICUT BANK AND TRUST COMPANY

ONE CONSTITUTION PLAZA  
HARTFORD, CONNECTICUT 06115

January 14, 1977

Division Engineer  
U.S. Army Corps of Engineers  
New England Division  
424 Trapelo Road  
Waltham, Massachusetts 02154

Dear Sir:

Please include my name on your mailing list of those people interested in receiving information on the proposal to increase the height of the Connecticut River dike in East Hartford, Connecticut.

CBT's Operations Center is located directly adjacent to the dike in the Founders Plaza Redevelopment Area and any projects relating to the dike are of vital interest to us.

Thank you for your prompt attention to this matter.

Cordially,

  
James D. Crocker  
Assistant Treasurer

JDC/sh

WATER RESOURCES INVESTIGATION

CONNECTICUT RIVER BASIN  
EAST HARTFORD, CONNECTICUT

ATTACHMENT OF PLAN OF STUDY

SCHEDULE OF WORK AND BUDGETARY DATA

JULY, 1977

REFERENCE ER 11-2-101 . WHICH STATES THAT: BUDGETARY INFORMATION IS NOT TO BE RELEASED OUTSIDE THE DEPARTMENT OF THE ARMY.



## TABLE OF CONTENTS

<u>Paragraph</u>	<u>Subject</u>	<u>Page</u>
1	General	A-1
2	Constraints and Controls	A-1
3	Preparation of Reports	A-2

## EXHIBITS

<u>Number</u>	<u>Subject</u>
1	Study Cost Estimate (PB-6)
2	Study Cost Estimate (FY Stages)
3	Study Activities
4	Milestones
5	Work Sequence Diagram

## ATTACHMENT

1. General - The East Hartford Local Protection Study, a Level C Feasibility study of survey scope, will research the need for providing a higher degree of flood protection primarily for that portion of East Hartford already protected by the existing dike system constructed subsequent to the record March 1936 event. Initial contacts with local officials have indicated that additional flood control was the major concern of residents, therefore, emphasis will be placed on developing alternative plans both structural and non-structural to increase the level of protection.

Estimates of cost for each major element of the study are shown in Exhibit 1. A breakdown of anticipated funding for these elements by Fiscal Year is shown in Exhibit 2. Exhibit 3 delineates the various items of work within each major element, while Exhibit 4 presents a graphic description of anticipated expenditures, check-point dates and milestone dates.

2. Constraints and Controls - The following controls will be utilized throughout the study period.

a. Initial funds of \$2,000 were provided for Fiscal Year 1976T. Work included initiation of the study effort, initial public contracts and an existing data search.

b. In Fiscal Year 1977, \$75,000 has been allocated to complete the Plan of Study and also for the development of alternate plans for additional flood control and related water and land resources. Environmental studies will be initiated and engineering plans will be formulated including project costs and economic justification. In addition, the original damage surveys completed after the March 1936 event will be updated to reflect the significant physical changes which have occurred during the past forty years. Continuous public involvement will be maintained throughout the study and a Formulation Stage Public Meeting is scheduled to be held in October 1977.

c. In Fiscal Year 1978, \$88,000 will be required to refine the development of alternate plans and to accomplish the development of detailed plans. A system of accounts for the multi-objective frame-

work will be prepared during this stage. Also, final iterations of the four functional tasks will be made to develop a justified plan of action which satisfied the study objective and serves to best meet the needs and desires of local interests. If no plans of improvement are feasible a negative report will be prepared.

d. All items of the study will be in accordance with the regulations of the Corps of Engineers. Special attention will be given to studies concerning the degree of protection, maximization of net benefits, and environmental enhancement.

3. Preparation of Reports - The Plan of Study contains the specifications for the investigation and methods to be used, physical work to be accomplished, precision and accuracy required, schedules to be met, and coordination to be affected. A draft feasibility report, to be prepared in advance of the Stage III check-point conference will contain the conclusions reached after completion of the following items of work:

Hydrologic design related to required height of protection.

Foundation and materials investigations.

Design and Cost Estimates.

Economic Studies and Damage Surveys.

Effects assessment and environmental analysis.

Real Estate Studies.

Benefit to Cost Analysis.

Description of Selected Plan.

Conclusions.

The final report will be prepared and submitted to OCE after the Stage III public meeting is held. Submission of the report is scheduled for September 1978.

Study Cost  
Estimate (PB-6)  
ER 11-2-220

Appropriation Title: General Investigations  
Category: Surveys  
Class: Flood Control Study

Name of Study: East  
Hartford  
Location: Connecticut

Subfeature

Current Fed. Cost Estimate

Number Title	Feature			Feature Total	Previous (1/10/76)	
	Stage 1	Stage 2	Stage 3		Estimate	Remarks
01. Public Involvement	500	3,500	5,000	9,000	5,000	
02. Institutional Studies	0	0	2,000	2,000	1,000	
03. Social Studies	1,000	1,000	1,000	3,000	2,000	
04. Archeological Studies	0	0	2,000	2,000	2,000	
05. Environmental Studies	2,000	3,000	5,000	10,000	10,000	
06. Economic Studies	500	5,000	2,500	8,000	8,000	
07. Surveying & Mapping	0	500	1,500	2,000	5,000	
08. Hydrology & Hydraulic Investigations	1,500	7,500	6,000	15,000	12,000	
09. Foundations & Materials Investigations	0	5,000	6,000	11,000	10,000	
10. Design & Cost Estimate	0	10,000	25,000	35,000	35,000	
11. Real Estate Studies	0	2,000	3,000	5,000	5,000	
12. Study Management	2,000	2,000	2,000	6,000	6,000	
13. Plan Formulation	2,000	4,000	4,000	10,000	6,000	
14. Report Preparation	500	1,500	3,000	5,000	5,000	
20. Other Studies	0	2,000	2,000	4,000	-----	F&W Report
30. S&A	3,000	14,000	21,000	38,000	38,000	
TOTAL	13,000	61,000	91,000	\$165,000*	\$150,000	

Division: New England

Region: New England

\* Study Cost increased \$15,000 to include Federal pay raise (\$11,000) and fish & wildlife studies (\$4,000)

Exhibit 1

PLAN OF STUDY  
EAST HARTFORD LOCAL PROTECTION  
MODIFICATION STUDY

STUDY COST ESTIMATE

Cost Classification	Current Cost Estimate	Stage I		Stage II	Stage III
		FY 76T	FY77	FY 1977	FY 1978
01. Public Involvement	9,000	0	500	3,500	5,000
02. Institutional Studies	2,000	0	0	0	2,000
03. Social Studies	3,000	0	1,000	1,000	1,000
04. Archaeological Studies	2,000	0	0	0	2,000
05. Environmental Studies	10,000	0	2,000	3,000	5,000
06. Economic Studies	8,000	0	500	5,000	2,000
07. Surveying & Mapping	2,000	0	0	500	1,500
08. Hydrology & Hydraulic	15,000	0	1,500	7,500	6,000
09. Foundations & Materials	11,000	0	0	5,000	6,000
10. Design & Cost Estimates	35,000	0	0	10,000	25,000
11. Real Estate Studies	5,000	0	0	2,000	3,000
12. Study Management	6,000	400	1,600	2,000	2,000
13. Plan Formulation	10,000	0	2,000	4,000	4,000
14. Report Preparation	5,000	0	500	1,500	3,000
20. Other Studies	4,000	0	0	2,000	2,000
30. Supervision & Administration	38,000	100	2,900	14,000	21,000
TOTAL	165,000	500*	12,000	61,000	91,000

\*Actual Expenditures

Exhibit 2

PLAN OF STUDY  
EAST HARTFORD LOCAL PROTECTION PROJECT  
MODIFICATION STUDY

STUDY ACTIVITIES

Cost  
Class

Feature

**.01 PUBLIC INVOLVEMENT**

Establish Coordination.  
Preliminary Identification of Problems  
and Needs.  
Public Contact & Information Bulletins.  
Arrangement for Formulation Public  
Meeting.  
Formulation Public Meeting.  
Arrangements for Late Stage Public  
Meeting.  
Review of Impact Reports by Other  
Agencies.

**.02 INSTITUTIONAL STUDIES**

Analysis of Existing Institutional Frame-  
work.  
Assessment of Ways and Means to  
Implement the Recommended Plan.

**.03 SOCIAL STUDIES**

Attitude Survey of Local Residents Regarding  
Preliminary Alternatives.  
Survey of Population Characteristics.  
Housing Studies.  
Recreation and Leisure Studies.  
Studies of Community Cohesion.

**.04 CULTURAL RESOURCE STUDIES**

Preliminary Determination of Alternative  
Plans Upon Historical, Architectual and  
Archeological Resources.

.05

## ENVIRONMENTAL STUDIES

Inventory of Baseline Environmental Resources.  
Preliminary Effects Assessment & Environmental Study & Analysis.  
Effects Assessment and Environmental Analysis.  
Fish and Wildlife Studies.  
Enhancement and Mitigation Studies.  
Recreation Studies.  
Environmental Report.  
Effects Assessment Report.  
Preliminary Environmental Impact Statement.

.06

## ECONOMIC STUDIES

Preliminary Economic Base Study.  
Employment and Labor Force Study.  
Land Use Study.  
Business and Industrial Development Survey.  
Population Projections and Other Demographic Studies.  
Flood Damage Surveys.  
Benefit/Cost Analysis.  
Economic Report.

.07

## SURVEYING AND MAPPING

Aerial Topographics.

.08

## HYDROLOGY AND HYDRAULICS INVESTIGATIONS

Determination of Water Resource Capability and Generalized Hydrologic Relations.  
Preliminary Hydrologic Design and Field Reconnaissance.  
Hydrologic and Hydraulic Design.  
Hydrology and Hydraulics Report.

.09

## FOUNDATIONS AND MATERIALS

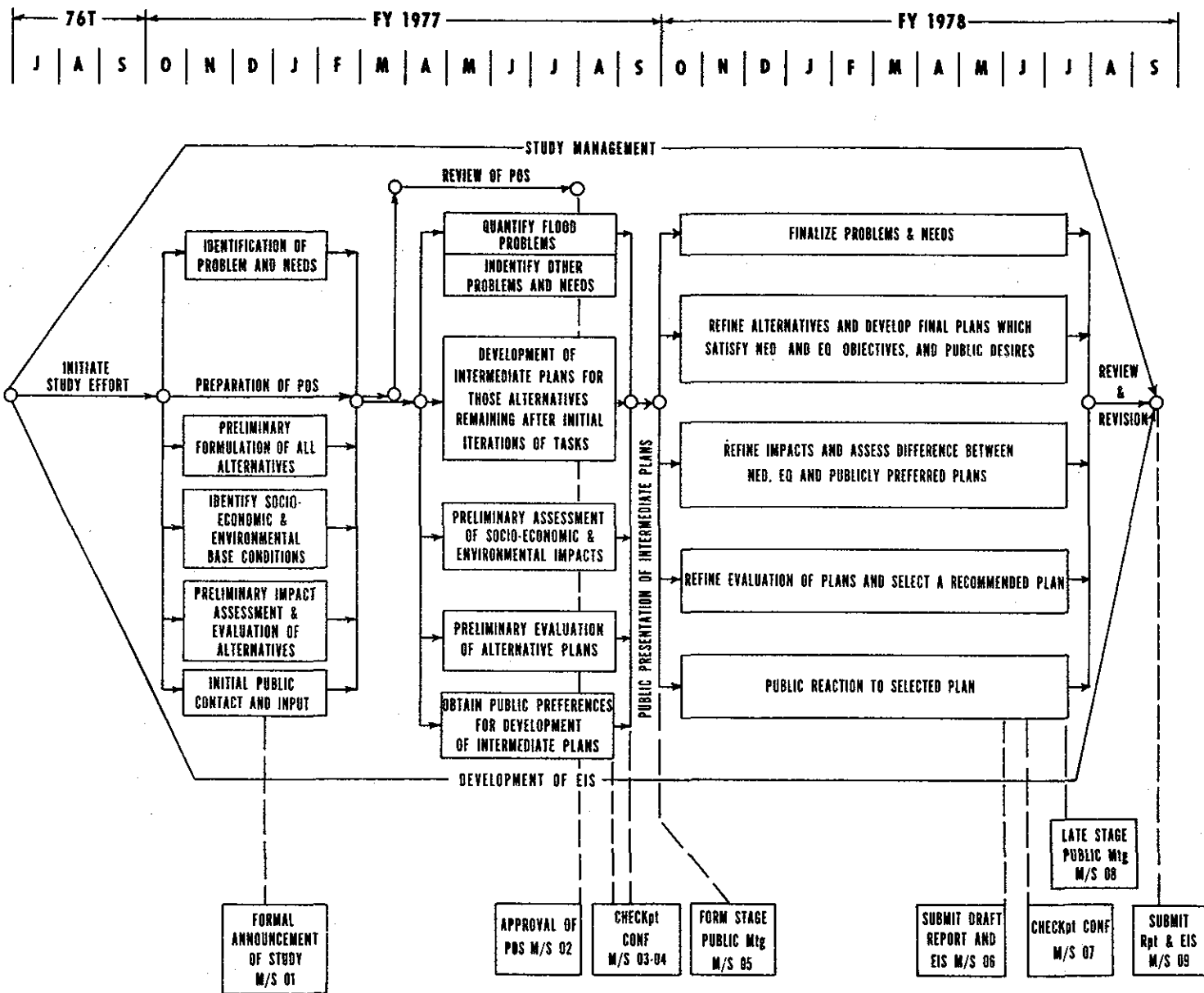
Field Reconnaissance and Investigations.  
F and M Report

- . 10            DESIGN AND COST ESTIMATES
  - Field Reconnaissance.
  - Preliminary Design and Cost Estimates.
  - Design and Cost Estimates.
  - Design and Cost Estimate Report.
- . 11            REAL ESTATE STUDIES
  - Preliminary Real Estate Studies.
  - Real Estate Report.
- . 12            STUDY MANAGEMENT
  - Cost Apportionment, Scheduling and Other Management Functions.
  - Checkpoint Meetings and Preparation.
- . 13            PLAN FORMULATION
  - Problems and Needs Development.
  - Alternative Development.
  - Formulation Studies.
  - Public Involvement Strategies.
  - Impact Assessments and Evaluation
  - Statement Finds.
- . 14            REPORT PREPARATION
  - Preparation of Draft of Main Report.
  - Prepare and Reproduce Main Report.
- . 20            OTHER STUDIES
- . 30            SUPERVISION AND ADMINISTRATION
  - Draft Review.
  - S and A



PLAN OF STUDY  
EAST HARTFORD LOCAL PROTECTION  
SCHEDULE OF MILESTONES

<u>No.</u>	<u>Feature (ER-18-2-2)</u>	<u>Date</u>	<u>No.</u>	<u>Feature (Proposed ER 11-2-120)</u>	<u>Date</u>
1.	Initial Public Meeting	76-12	1.	Initiation of Study	76-12
2.	Approved Plan of Study	77-07	2.	Approval of Plan of Study	77-07
3.	Submission of Phase I Report	77-08	3.	Stage II, Checkpoint Conference	77-08
4.	Checkpoint I Conference	77-09	4.	Stage II, Checkpoint Conference (Optional)	77-09
5.	Formulation Stage Public Meeting	77-10	5.	Formulation Stage Public Meeting	77-10
6.	Checkpoint II Conference	78-04	6.	Sub. Draft Report & EIS	78-05
7.	Completion of Draft Report	78-06	7.	Stage III, Checkpoint Conference	78-06
8.	Completion of Review	78-08	8.	Stage III, Public Meeting	78-06
9.	Late Stage Public Meeting	78-09	9.	Sub. Final Report & EIS	78-09
10.	Submit Report	78-09	10.	Release Public Notice	78-09



**EXHIBIT 5**  
**Work Sequence Diagram**  
**East Hartford Modification Study**